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INTRODUCTION

A. HISTORY

A WSDOT Sign Design Guide was made available by our Olympia Service Center Traffic Section in June, 1999. That document, which resulted from a joint effort between OSC Traffic and Parsons Brinkerhoff Consultants, forms the basic framework of this Current Practices Manual. However, the Northwest Region has modified and expanded the 1999 document to accommodate Northwest Region policies. Sections of text that are new or have been revised from the 1999 document are identified within this Current Practices Manual by a vertical bar along the right margin.

B. APPLICABILITY

All WSDOT and Consultant Design offices planning to do sign design work or signing PSE for WSDOT Northwest Region should access this Current Practices Manual and closely follow the guidelines contained herein.

NOTE TO DESIGNERS:

WSDOT or Consultant Designers assigned to Northwest Region projects that include Signing PS&E shall contact the Northwest Region Traffic Sign Design Team early in the design development phase of the project (for names and numbers of Sign Design Team members, see Appendix E of this manual). This early contact will allow an appropriate assessment of project signing needs, the timely assignment of tasks necessary to the design file and PS&E for the project, and the establishment of a PS&E coordination schedule between the Northwest Region Traffic Sign Design Team and the designers for the project.

NOTE TO CONSULTANTS:

In addition to the items listed just above, Consultants shall also access the "CONSULTANT INFORMATION" section located within this manual (Appendix F) and within the NW Region Traffic Services website. The "CONSULTANT INFORMATION" section provides additional clarification regarding the correct design process and coordination efforts that are required between Consultants and the Northwest Region Traffic Sign Design Team. Both the "CONSULTANT INFORMATION" section and this Current Practices Manual are accessible at <http://www.wsdot.wa.gov/regions/Northwest/Traffic> Services/Traffic Sign Design).

C. PURPOSE

The purpose of this manual is to provide designers with a systematic approach to developing permanent signing plans, specifications, and estimates (PS&E), including the design of the actual signs. The process set forth in this manual is intended to result in more standardized signs and signing plans.

This manual will take the designer through the logical process of developing a PS&E package, from project inception to the finalizing of the PS&E plan set including the selection, design, and placement of static signs.

When static signs are not appropriate for the situation, other alternatives, such as Variable Message Signs (VMS) may be considered. Refer to the Northwest Region ITS guide when using VMS signs. This Current Practices manual does not address the use or design of VMS signs or work zone signing.

D. REFERENCES AND STANDARDS

As stated, this Current Practices manual modifies and expands the 1999 Sign Design Guide from OSC Traffic. This manual does not officially supersede other regular manuals normally used to assist in Sign Design work (see list below), but rather serves as the starting and reference point when accessing the other manuals for information. If minor differences are found when comparing manual references on the same subject, designers should follow the recommendations of this Current Practices Manual.

Have the following references accessible:

1. Manual on Uniform Traffic Control Devices (MUTCD) For Streets and Highways:

Establishes uniform standards for signs and other traffic control devices for all types of roadways. This is a Federal document that has been adopted by Washington State as law (RCW 47.36 and WAC 468-95), and is used throughout the nation by most agencies to create uniformity in traffic control devices nation-wide. The words “shall”, “should”, and “may” play an important role in this manual. Their definitions are located in Section 1A-5.

2. Washington State Modifications to the MUTCD:

The Washington State Department of Transportation publishes this booklet which contains WAC 468-95, FHWA Errata Notification to the MUTCD, and FHWA Revisions to the MUTCD. WAC 468-95 contains modification to specific parts of the MUTCD and addresses traffic control considerations that are unique to the state of Washington. This booklet is to be used in conjunction with the MUTCD.

3. WSDOT Traffic Manual:

Chapter 2 deals with signing. It provides clarification and interpretive guidance to the MUTCD and assures uniform statewide application of signs. This manual is to be used in conjunction with the MUTCD.

4. WSDOT Design Manual:

Section 820 deals with signing. It includes sections on lateral and vertical placement, post selection, and guidelines for overhead sign lighting. These are basic design standards required by WSDOT.

5. WSDOT Sign Fabrication Manual:

Gives overall sign dimensions and layout characteristics including text and symbol sizes. It was developed to assist both public and private sign manufacturers in maintaining the uniform appearance of official highway signs. The sign numbering in this manual coincides with the sign number as presented in the MUTCD.

6. WSDOT Standard Plans:

G series contains standard plans for the construction and installation of sign structures on various types of supports, including details for the sign supports.

7. WSDOT Standard Specifications:

Section 8-21 refers to the installation of permanent signs installed under construction contracts. Section 9-28 refers to material and fabrication requirements.

8. WSDOT Construction Manual:

Section 8-21 refers to permanent signing and gives requirements for the inspection of signing construction projects.

9. WSDOT Plans Preparation Manual:

Sections 460.19 and 460.22 through 460.24 give requirements for signing plans, (460.19 Plan Detail). Division 6 refers to specifications, and Division 8 refers to estimates. This manual refers to the above references, and will attempt to explain their intent and/or use as they pertain to sign selection, design, placement, and PS&E preparation.

It should also be noted that this manual presents both Metric and English units. The variation in units used is due to the source of information. In order to remain consistent with the source, units quoted are presented in the same fashion as the source. For instance, the MUTCD only presents dimension in English units, therefore, anything in this manual referenced from the MUTCD is presented in English units.

E. AUTHORITY

This manual presents guidelines for developing signing PS&E for WSDOT Northwest Region. The principles outlined herein should be considered strong recommendations for sign design and PS&E development. Deviations from the procedures recommended by this manual may result in PS&E delays.

F. SIGNING PRINCIPLES

Traffic control devices help insure roadway safety by providing for the orderly and predictable movement of all traffic. They are used to assist motorists in guidance and navigation tasks on all public roads.

To be effective, all traffic control devices should meet these five basic requirements:

1. Fulfill a need.
2. Command attention.
3. Convey a clear, simple meaning.
4. Command respect of road users.
5. Give adequate time for proper response.

The above requirements are met through design, placement, operation, maintenance, and uniformity.

Signs are a particular type of traffic control device whose purposes are to state regulations that would otherwise not be apparent, warn of roadway hazards, give information to roadway users, and guide motorists to desired destinations.

Design of signs should assure that the sign size, shape, colors, contrast, simplicity and lighting or reflectorization provide a clear message, draw attention, command respect, and allow adequate time for proper response. Sign design is discussed in Chapter V of this manual.

Placement of the sign should assure that it is within the motorist's cone of vision, that it is positioned with respect to the point, object, or situation, and that it will allow the motorist adequate time to respond. Sign placement is discussed in Section F of this chapter, Chapter IV "Preliminary Signing Plan", and Chapter VI "Sign Installation".

Operation or application should assure that appropriate signs are installed to meet a traffic requirement at a given location. Furthermore, signs shall be placed in a uniform and consistent manner to meet drivers' expectations based on previous exposure to similar situations and signs.

Maintenance of signs is needed to assure clean, legible, and properly mounted signs. Though maintenance of signs is not the direct responsibility of the designer, it does have a bearing on those who use the roadways. Improperly maintained devices will negate the designer's intent and could create an unsafe or hazardous situation. Although maintenance is not addressed in this guide, the designer must still consider how a sign will be maintained and then design to meet that need.

Uniformity of sign design, application and installation simplifies the task of the motorist, because it aids in recognition and understanding. It also aids road users, police officers, and traffic courts by giving everyone the same interpretation. Because uniformity applies to so many different aspects of proper signing, it is not discussed in a separate chapter but is mentioned throughout this manual.

G. SIGNING CONSIDERATIONS

Several factors must be taken into consideration with respect to signing. Does the selection, design and placement of signs meet all legal requirements? Do these aspects agree with human abilities? Is the location and design feasible to construct and maintain? Who is responsible for the signing and do other parties need to be contacted?

G1. LEGAL/POLICY REQUIREMENTS

Signs shall meet all legal requirements as set forth in the RCWs, WACs, MUTCD, and Traffic Manual. Modifications to these signs and established policies must have justification.

G1.A RCWS & WACS

The Revised Code of Washington (RCW) consists of laws passed by the Washington State Legislature.

RCW 47.36.030 gives the Secretary of Transportation the authority to adopt a legal standard to be used for traffic control devices.

RCW 47.36.030 Traffic control devices - Specifications to be furnished to counties and cities. The secretary of transportation shall have the power and it shall be its duty to adopt and designate a uniform state standard for the manufacture, display, erection and location of all signs, signals, signboards, guideposts and other traffic devices.....

The Washington Administrative Code (WAC) is a state certified publication that provides a set of permanent rules necessary to implement laws (RCWs) which have been formally adopted or amended by Washington State agencies.

Requirements of the RCWs and WACs are referred to or have been incorporated in the Washington State Modifications to the MUTCD and the Traffic Manual.

G1.B MUTCD

WAC 468-95 has adopted the MUTCD with modifications as the state standards for all roadways in the state. *“The Manual on Uniform Traffic Control Devices for Streets and Highways” (MUTCD), 2001 Millennium Edition..... Was duly adopted by Administrative Order 127 of the Secretary of Transportation dated December 19, 1990.”* All requirements of the MUTCD shall be adhered to unless otherwise noted in the Washington State Modifications to the MUTCD.

G1.C WSDOT TRAFFIC MANUAL

The Traffic Manual cites WSDOT policies and supplements the MUTCD. Always check the Traffic Manual when developing signing plans, as some WSDOT policies may be more concise than or differ from the MUTCD.

G2. HUMAN ABILITIES

Traffic signs and their placement are “engineered” to fit the conditions that the motorist will encounter while driving. The signs themselves are engineered to provide motorists with legible (the ability to see) and readable (the ability to read) messages, while the locations are engineered to provide maximum conspicuity and adequate response time. This engineering is based on human abilities since signs are only effective if motorists, unfamiliar with the area, are able to recognize and respond to them as intended by the designer.

The time taken to recognize and respond to a sign is called the PIEV (Perception / Identification / Emotion / Volition) time.

- Perception is the time it takes to see the sign.
- Identification is the time to read and understand the sign.
- Emotion is the time to consider the meaning and make a decision.
- Volition is the time to react or execute a maneuver.

It is the designer’s job to ensure that each of these actions is simplified for the motorist. Uniformity plays a major role in doing this. By treating all like situations the same, regardless of the location, using standardized shapes, colors and symbols, and locating the signs in consistent locations, drivers will develop certain expectations. When these expectations are met the perception and identification process will be accelerated, leaving more time for the emotion and volition.

G2.A) PERCEPTION

All signs should be designed and strategically installed to catch the driver’s attention. Sign colors have been predetermined for maximum conspicuity, while sign size is dependent on roadway speed. In addition, signs should be placed where they will not

blend in with the background. Being consistent with sign installations for similar situations will fulfill drivers' expectations on where to find the sign.

Like design and installation, the number of signs located in an area can also influence perception. Extensive use of non-critical signs create "sign clutter" and can desensitize motorists to the sign presence regardless of its importance. This is true not only within limited areas, but also for widespread use of signs, therefore the use of signs should be limited to essential signing only.

G2.B) IDENTIFICATION

Once the sign has been seen, it is then read or interpreted. The sight distance is the unobstructed distance in advance of a sign. The sight distance of a sign shall be at least great enough to allow the sign to be seen and read before passing it. Section 2.6A of the Traffic Manual gives this information on perception and comprehension times:

"Studies indicate the average driver comprehends three words per second after a perception time of up to two seconds (commonly used messages require less recognition time than unique messages)."

Sight Distance Example

On a 60 mph roadway, what is the sight distance required for the following sign?



D8-201

2 sec. (for perception) + Number of words/3 (3 words per sec.) = time required
2 sec. + (4/3) = 3.3 sec.

Driver is traveling at 60 mph = 88 feet per second (fps)

88 fps x 3.3 sec. = 293 feet

Minimum required sight distance is 293 feet

In order to allow the maximum "identification time", signs shall be concise, and easy to understand and recognize. The MUTCD has established standard colors, shapes, symbols, and message formats to facilitate in sign recognition. Different classifications of signs have been assigned different colors and shapes, see Table I.1.

Table I.1 - Sign Identification

<u>Sign Classification</u>	<u>Color</u> (Background/Legend)	<u>Shape*</u>
Regulatory:		
• Stop, Yield, Do Not Enter, Wrong Way	Red/White	**Rectangle with longer side vertically.
• One Way	Black/White	
• All Regulatory (except as noted above)	White/Black	
Warning	Yellow/Black	Diamond
Construction and Maintenance Warning	Orange/Black	Diamond
Guide (General)	Green/White	Rectangle
Recreational and Cultural (Guide)	Brown/White	Rectangle or Trapezoid
Motorist Service Signing (Guide)	Blue/White	Rectangle

*Shapes noted are general. See MUTCD and Sign Fabrication Manual for shapes of specific signs.

**For White/Black signs.

All signs in the MUTCD and Sign Fabrication Manual indicate the background and legend color to be used. The legend colors have been pre-selected to provide maximum contrast with the background color. All special signs shall have the same color and shape as standards signs with similar functions.

In order to read the sign successfully, the letters shall be of sufficient height. Section 2.6A of the Traffic Manual gives the following equation for determining letter height based on the roadway speed:

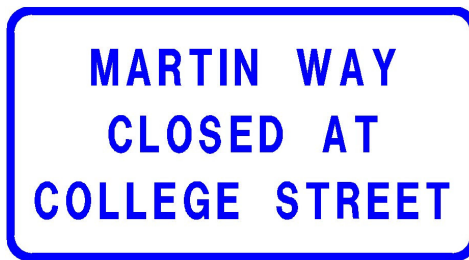
Letter Height Calculation

$$\text{Letter Height} = (N/3 + 2) f$$

Where: N = Number of words.

f = Legibility Factor. Found by dividing vehicle speed in feet per second by 40 (the legibility distance per inch of letter height). Even though the Traffic Manual uses 50 feet per inch, due to the increasing average age of motorists, 40 feet per inch should be used and will be incorporated in the next update to the Traffic Manual.

Example:



Speed = 60 mph

$N = 6$

$f = (60 \text{ mph} \times 1.47) / 40 = 2.2$

Letter Height = $(6/3 + 2) 2.2 = 8.8'' \Rightarrow$ Use 8'' (for Capitals or Upper Case)

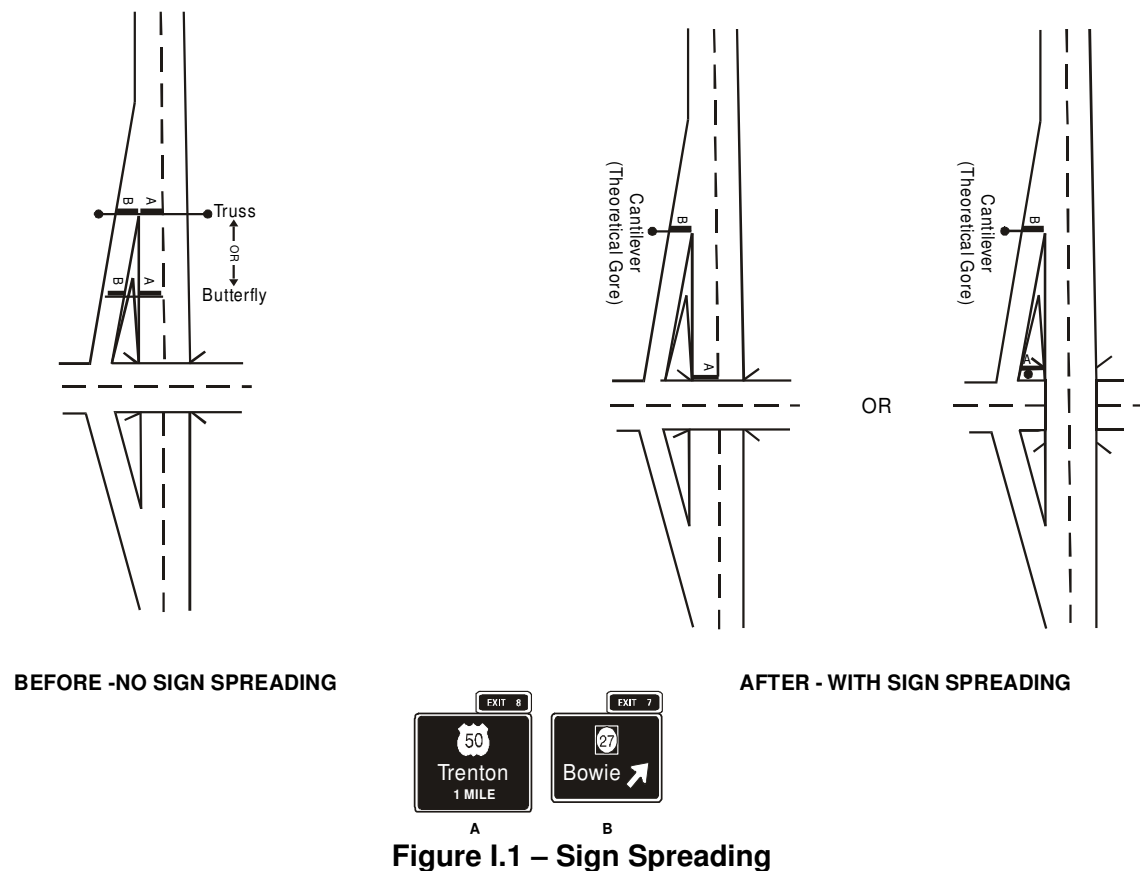
See Chapter V, "Sign Design," for letter height conversions. Per Appendix C of the Sign Fabrication Manual, available letter heights are as follows:

All Capitals		Upper / Lower Case	
Inches		Inches	
4		6 / 4.5	
5		8 / 6	
6		10.67 / 8	
8		13.33 / 10	
10		16 / 12	
12		20 / 15	
18		24 / 18	

Another way of simplifying the identification process is to use "sign spreading" (MUTCD Section 2E-31, page 2E-16) when the advance guide sign for the next interchange falls within the limits of the current interchange. See Figure I.1.

This technique spaces the exit direction and the advance guide signs as to not overload the motorist with a group of signs at one location. Sign Spreading is accomplished as follows:

1. The exit direction is the only sign used in the vicinity of the exit gore (usually on a cantilever structure).
2. The advance guide sign for the next interchange is placed on the interchange undercrossing, if applicable, or on a cantilever or post mount located behind the guardrail leading to the bridge rail.



Use sign spreading for all single exit interchanges and when possible, at multi-exit interchanges.

G2.C) EMOTION AND VOLITION

The complexity of the situation and the driver's capabilities dictate the time required to make a decision and react (emotion and volition) to information provided on signs. In order to allow sufficient time for this process for all types of drivers, perception and identification, as discussed above, should be as fast as possible.

Determining the time needed for emotion and volition can be a difficult task. To aid in these calculations a standardized table (Table II-1) has been developed for placement of warning signs and is presented in the MUTCD, Section 2C-3, page 2C-2a. Since warning signs are used to warn motorists of upcoming hazardous conditions, their placement with respect to emotion and volition is critical. Table II-1 "A Guide For Advance Warning Sign Placement Distance" lists suggested minimum sign placement distance in advance of the specified condition. These distances are based on the

posted speed and PIEV times from about 3 seconds to 10 seconds. Since it is difficult to determine the PIEV time needed for each possible situation, Table II-1 is segregated

into three conditions: “high judgment”, “stop”, and “deceleration”, which are labeled as conditions A, B, and C respectively.

- *Condition A*, “high judgment”, requires the driver to use extra time in making and executing a decision because of a complex driving situation. Lane changing, passing, and merging are all considered high judgment conditions. A W4-2 (lane reduction transition sign) is an example of a condition A warning sign.
- *Condition B*, “stop”, is a situation in which the driver will likely be required to stop. A W3-1 (stop ahead sign), a W3-2 (yield ahead sign) and a W3-3 (signal ahead sign) are all examples of condition B warning signs.
- *Condition C*, “deceleration”, is a situation in which the driver will likely be required to decelerate to a specific speed. Table II-1 is further segregated for condition C into advisory or desirable speed for the condition. A W1-2 (curve sign) is an example of a condition C warning sign.

Sign Placement Example:

On a 55 MPH roadway, at what distance in advance of a 30 MPH advisory speed curve should the warning sign be placed?

This falls under Condition C because deceleration is required.

From Table II-1, a minimum distance of 400 feet is recommended.

If the advisory speed had been 35 MPH, you would interpolate between the minimum distances of 30 MPH and 40 MPH. The minimum distance at 35 MPH would be $(400+300)/2 = 350$ feet.

Table I.2 Advance Warning Sign Placement

Posted or 85th-Percentile Speed	Condition A: Speed reduction and lane changing in heavy traffic ²	Advance Placement Distance ¹							
		Condition B: Deceleration to the listed advisory speed (mph) for the condition ⁴							
		0 ³	10	20	30	40	50	60	70
20 mph	225 ft	N/A ⁵	N/A ⁵	-	-	-	-	-	-
25 mph	325 ft	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-
30 mph	450 ft	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-
35 mph	550 ft	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-
40 mph	650 ft	125 ft	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-
45 mph	750 ft	175 ft	125 ft	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-
50 mph	850 ft	250 ft	200 ft	150 ft	100 ft	N/A ⁵	-	-	-
55 mph	950 ft	325 ft	275 ft	225 ft	175 ft	100 ft	N/A ⁵	-	-
60 mph	1100 ft	400 ft	350 ft	300 ft	250 ft	175 ft	N/A ⁵	-	-
65 mph	1200 ft	475 ft	425 ft	400 ft	350 ft	275 ft	175 ft	N/A ⁵	-
70 mph	1250 ft	550 ft	525 ft	500 ft	425 ft	350 ft	250 ft	150 ft	-
75 mph	1350 ft	650 ft	625 ft	600 ft	525 ft	450 ft	350 ft	250 ft	100 ft

¹ The distances are adjusted for a sign legibility distance of 50 m (175 ft) for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 75 m (250 ft), which is appropriate for an alignment warning symbol sign.

² Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge, Right Lane Ends, etc. The distances are determined by providing the driver a PIEV time of 14.0 to 14.5 seconds for vehicle maneuvers minus the legibility distance of 50 m (175 ft) for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, or Signal Ahead. The distances are based on the 2001 AASHTO Policy for Stopping Sight Distance, Exhibit 3-1, providing a PIEV time of 2.5 seconds, a deceleration rate of 3.4 m/second^2 (11.2 ft/second^2), minus the sign legibility distance of 50 m (175 ft).

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, or Cross Road. The distance is determined by providing a 2.5 second PIEV time, a vehicle deceleration rate of 3 m/second^2 (10 ft/second^2), minus the sign legibility distance of 75 m (250 ft).

⁵ No suggested minimum distances are provided for these speeds, as placement location is dependent on site conditions and other signing to provide an adequate advance warning for the driver.” The values given in Table II-1 are for guidance purposes only and shall be applied with engineering judgment. They are to be used for level roadways only.

The placement of guide signs and regulatory signs are not always based on emotion and volition as these signs do not always require the driver to perform an action. The placement of most guide signs has been identified in Sections 2E and 2F of the MUTCD under discussions of the specific sign type. It has been determined that guide sign spacing, especially in advance of exit ramps, should be a minimum of 800 feet to allow sufficient time for PIEV (MUTCD Section 2E-25, page 2E-10, Traffic Manual Section 2.6). Like guide signs, most regulatory sign placement is also identified in the MUTCD in Section 2B under discussions of specific sign types. Some guide and regulatory signs however are based on emotion and volition and need to be located according to Table II-1. R2-5c(speed zone ahead sign) is an example of a regulatory sign placed according to emotion and volition. Locate this sign according to Condition C of Table II-1.

Sign placement is further discussed in Chapter IV of this guide.

G3.MAINTAINABILITY AND CONSTRUCTIBILITY

Signs must be installed where they are needed or required. However when selecting the locations, consider possible problems with maintenance or construction, as an adjacent location may be more suitable for the sign installation. Guide signs can generally be moved a few hundred feet in either direction. Warning and regulatory signs may be moved unless the location is critical, such as with stop signs. However, do not move a warning sign closer to the hazard than the minimum recommended distance. Consider the following maintainability and constructability issues:

- Level Ground - Always try to locate multi-post signs on level ground, rather than on cut or fill slopes. On steep fill slopes wide signs will generally require very long supports. Consider moving the sign to a more level area or consider the construction of a sign berm. A sign berm is the widening of the grade to provide a level platform for the sign support.

- Utilities - Underground utilities may conflict with post depths or foundations. Overhead utilities may conflict with sign structures and present a hazard to the sign installer or maintenance personnel. Consider moving the sign location, or if necessary, the utility location.
- Ground Material - Ground material such as rock will make sign installation difficult. Consider moving the sign, if possible. If the sign location is critical, then special arrangements or installation assemblies may be necessary.
- Access - Access to a sign location is not a critical issue; however, it is always good practice to install signs where they are easily accessible by the installer and maintenance personnel. A location without easy access will discourage proper maintenance of the sign. Consider where the installation/maintenance vehicle will park, the level of difficulty required to install the sign, and any special equipment, such as a bucket truck, that may be needed for installation and maintenance.

G4. RESPONSIBLE PARTIES

The WSDOT is responsible for all signing on interstates and state routes, except on state routes within cities having a population of 22,500 or more, per RCW 47.24.020.

RCW 47.24.020 Jurisdiction, control.The department shall erect, control, and maintain at state expense all route markers and directional signs, except street signs, on such streets.

The department shall install, operate, maintain, and control at state expense all traffic control signals, signs, and traffic control devices for the purpose of regulating both pedestrian and motor vehicular traffic on, entering upon, or leaving state highways in cities and towns having a population of twenty-two thousand five hundred or less.....

Cities and towns having a population in excess of twenty-two thousand five hundred..... shall install, maintain, operate, and control such signals, signs, and devices at their own expense, subject to approval of the department for the installation and type only.

Table I.3 clarifies the responsibilities of the WSDOT on state routes within cities of over 22,500 and under 22,500.

Through an agreement with the County Road Administration Board, the WSDOT is also responsible for stop signs on county roads entering a state highway. However, stop ahead signs are still the responsibility of the county. Signs, including stop signs, on private road approaches are the responsibility of the approach owner.

When signing for locations off the state highway system, the local agency is responsible for follow-through signing to direct the motorist to the destination. See Chapter IV Section F-1c "Follow-Through Signing" for further discussion. RCW 47.36.300 gives local agencies the authority to erect follow-through signing for motorist service signing, and to charge the business for reimbursement of the installation.

Table I.3 - Responsible Agencies on State Routes

HIGHWAY ITEM	Population of Cities	
	Over 22,500	Under 22,500
Channelization	City	State
City Street Intersection—Surface.....	State	State
Crosswalks	City	State
Curbs and Gutters	State	State
Directional Signs (Prime)	State	State
Enforcement against R/W Encroachments.....	City	City
Guardrail	City	City
Illumination.....	City	City
Parking Signs.....	City	City
Regulatory Signs	City	State
Right of Way Cleanup.....	City	City
Roadside Ditches.....	City	City
Road Approach Culverts.....	City	City
Roadway Shoulders.....	State	State
Regulations of Utility Franchises	City	City
Roadway Surface.....	State	State
Route Markers	State	State
Sand Removal	City	City
Snow Removal.....	City	City
Street Cleaning	City	City
Street Sweeping.....	City	City
Stop Signs for intersections streets	City	State
Striping.....	City	State
Stability of Cuts and Fill Slopes	City	State
Underground Facilities (including storm sewers and cross culverts)	City	City

H. SIGNING CONSIDERATIONS

Regardless of the nature of the project, signing the project follows approximately the same steps. It is recognized that each project is different and requires engineering judgment, however the basic process of creating signing plans is essentially the same. The steps for signing a project are briefly discussed below and further discussed in subsequent chapters. Appendix A contains a checklist developed to aid in the signing process.

H1. Project Overview:

Understand the purpose of the project, what elements the project will contain (i.e. widening of existing roadway, signal installation), and what the signing needs are.

H2. Site Visit and Inventory of Existing Signs:

Visit the project site to gain a general familiarity with the surroundings. Create an inventory of existing signs in order to determine which signs may be reused, which signs will require replacement, and the available space for new installations (also see the note to designers on p.23 of the manual). Include signs beyond the project limits in the inventory to ensure continuity of signing is maintained.

H3. Preliminary Signing Plan:

Review signing requirements as set forth in the MUTCD and Traffic Manual to determine which signs are required for each condition within the project. Create a preliminary signing plan showing required signs. Appropriate existing signs compiled from the sign inventory can then be evaluated to determine if they can be reused.

H4. Design of Signs:

Once the appropriate signs have been selected, design new signs in terms of legend, spacing, size and material.

H5. Sign Installation:

Determine the exact location for each sign to be installed and what type and size of support will be used.

H6. Signing PS&E:

In most cases, contract plans, specifications, and estimates are required. All PS&E elements shall be as uniform as possible to avoid any confusion with the contractor, inspector and manufacturer. This will aid the designer in obtaining the desired constructed product.

PROJECT OVERVIEW

A. PROJECT OBJECTIVES

Determine the purpose of the project and what elements it involves. Coordination between all of the project elements, including signing, is needed to avoid any potential conflicts. Coordinate the signing with above ground features and underground utilities. Also determine the limits of the project. To maintain consistency throughout the route, the signing plans may need to extend beyond the project limits.

Consult the Design Manual to determine the design level for the project. All design levels (basic, modified and full) involve replacement of “deficient signing, as needed, using current standards”. Be sure to verify the design level through the Design Matrices, as some projects may include design variances for the signing.

B. PROJECT SIGNING

Different types of projects will involve different levels of signing installation, replacement, and relocation:

- New roadway construction will mainly include new sign installations, however, replacements and relocations may be needed for signs approaching the new roadway section.
- Widening of the existing roadway will mainly include replacements and relocation. A few new signs may also be needed for changes in channelization or an additional facility, such as a bike lane.
- Repaving of the existing roadway, updating of existing conditions, or maintenance are all good opportunities to replace any deficient signing.

Regardless of project type, existing signing must be verified for appropriateness, condition, etc., as identified in Chapter IV Section G, “Evaluation of Existing Signs”.

C. SPECIAL REQUIREMENTS

Additional signing may also be needed as a result of non-motorized (bicycle or pedestrian) facilities. Their presence is becoming more commonplace, therefore be aware of any special signing requirements for the project.

I. SITE VISIT/ INVENTORY OF EXISTING SIGN

The site visit(s) serves several purposes including becoming familiar with the surrounding area, identifying physical restrictions or limitations, noting any special conditions, and inventorying existing signs. It is recommended that the Maintenance Sign Specialist for that area and Regional Traffic Office be invited to participate in the on-site review or be asked for any input for the project. If the region has a control section file or traffic operations database, refer to it for any history of signing problems.

A. PROJECT FAMILIARITY

Spend some time becoming familiar with the surrounding area. This should include the viewing of a map prior to setting out to the field to get an idea of the surrounding routes and what the major destinations may be, and to pinpoint the exact location of the project. Once in the field get a general familiarity with the area including major traffic generators, surrounding terrain, and the signing scheme used on the remainder of the route. This will aid in determining signing needs and appropriate sign supports as dictated by terrain and route continuity.

B. RESTRICTIONS AND LIMITATIONS

Due to site features and characteristics there may be certain sight restrictions or sign placement limitations within the project area. As discussed under Chapter I Section G, "Signing Considerations," adequate sight distance shall be provided for all signs. Along with sight distance, the feasibility of the location is also important. Features such as narrow shoulder, steep cut slopes and elevated roadways can make some locations impractical for sign installation. Note features that may restrict sight distance or limit sign placement during the site visit. Some of the existing restrictions and limitations, such as side slopes, may change as a result of the project.

During the initial site visit, notes are usually only taken on general restrictions and limitations as the sign locations for the new design will not yet be determined. Obtain the following information during the initial site visit:

- Physical obstructions such as bridges, columns, signal or light standards, and other project features that may restrict sight distance. Also any utilities overhead or underground that could interfere with sign placement.
- Significant terrain features such as large ditches, steep cut slopes, or excessive vegetation that may restrict sight distance or limit possible sign locations due to constructibility or maintainability concerns.
- Restricting elements of the geometry of the roadway that may not be obvious in the basemaps. This may also include alignments of interchanges and intersections where the placement of signs may block sight distance for side streets.

- Physical structures such as bridge sections or retaining walls can be difficult and expensive locations for sign installations compared to ground mounted installations.

Special mounting assemblies may be needed and larger signs may need to be installed overhead. These locations should therefore be avoided whenever possible, unless dictated by signing needs.

- Space limitations between interchanges, intersections or significant features should be noted. This will aid in selecting signs and initial locations, as there may not be enough room for all desired signs without sign clutter. When space is limited the hierarchy of signs will determine which signs shall be installed and which will be omitted. A draft prioritization of supplemental guide signs can be obtained from the Department of Transportation.
- Other constructibility and maintainability issues, such as steep side slopes or undesirable ground material should be noted so the designer can avoid these areas, if possible, during the selection of sign locations.

Note existing signs without adequate sight distance or signs that may be difficult to maintain. Reuse of these sign locations are not recommended unless the sight distance or maintainability issue is improved, or the sign is relocated. The observation of existing signing deficiencies will help in avoiding the same problems with the new design.

After the preliminary signing plan has been prepared, and during the composition of the contract plans, when the actual sign locations are being chosen, make a second sight visit to confirm that the sight restrictions and physical limitations of the select locations will not interfere with the visibility, constructibility, and placement of the new signs. This will again require looking at obstructions (above and below ground), terrain, geometry, physical structures, space limitations and maintainability concerns.

C. SPECIAL CONDITIONS AND FEATURES

During the site visit, note any special conditions or features of the project site that are not clearly identified on the basemap. These could include scenic view points (official or unofficial), usage of adjacent land (that may generate large amounts of traffic either continuously or seasonally), special pedestrian and bicycle facilities, or other numerous features. This information will aid in identifying the need for special signing, and in determining appropriate locations for new signs. As there are numerous possible conditions and features, use judgment on what may affect signing.

D. PROJECT INVENTORY OF EXISTING SIGNS

Make a project inventory of the existing signs. This sign inventory will aid in determining which signs can remain, which signs need to be relocated, and which signs need to be removed, based on location, condition, and appropriateness.

NOTE TO DESIGNERS:

Before compiling the sign inventory you should ascertain the limits of WSDOT responsibility within the planned area of work(see chart on p. 15). Considerable time can be saved, particularly for projects inside large cities, by limiting the detailed sign inventory to only those existing signs for which WSDOT has maintenance responsibility.

If the designer has access to the WSDOT video log or SRview, it is a good idea to compile a preliminary project sign inventory using them. Also obtain a copy of the current Sign Inventory Listing from the NW Region Traffic Office. An example of the Sign Inventory Listing is shown in Appendix D to this manual (Forms and Examples). Having a preliminary inventory will save time when in the field. However, each of the signs will need to be field verified, as signs may have been knocked down, removed, replaced, relocated or installed since the video log, SRview or Sign Inventory Listing was created.

NW Region has it's own sign inventory format, so consult NW Region Traffic Office for a copy or use the example shown in Appendix D to this manual. The following items should appear in the project sign inventory:

Location of sign by Station or Milepost. The basemaps for the project may already include the actual sign location from the survey. When the basemaps show the existing signs, care shall be taken to ensure that ALL signs have been included and the locations are correct. Signs that were not included need to be identified along with station, MP, or distance from a known object, so these signs can be accurately added to the plans.

Horizontal Distance from edge of traveled way (W) and whether on left or right. This distance should be measured from the edge stripe to the centerline of the nearest post. See diagram in Figure III.I. This should not be confused with the horizontal dimension from the edge stripe to the edge of sign (referred to as the distance from traveled way). The distance from the edge stripe to the nearest edge of the sign is an important measurement and should always be a design consideration, but it is not included in the sign inventory information. Even if an existing sign can remain in the same location longitudinally, it may fall within the clear zone laterally, in which case the sign posts will need to be protected, placed on breakaway posts, or relocated out of the clear zone. Information on how to protect signs within the clearance zone can be found in the Design Manual. (Section 700, Roadway Safety) Note that when identifying whether the sign is on the right or the left, it refers to when "looking ahead on station" (in the direction of increasing station or milepost).

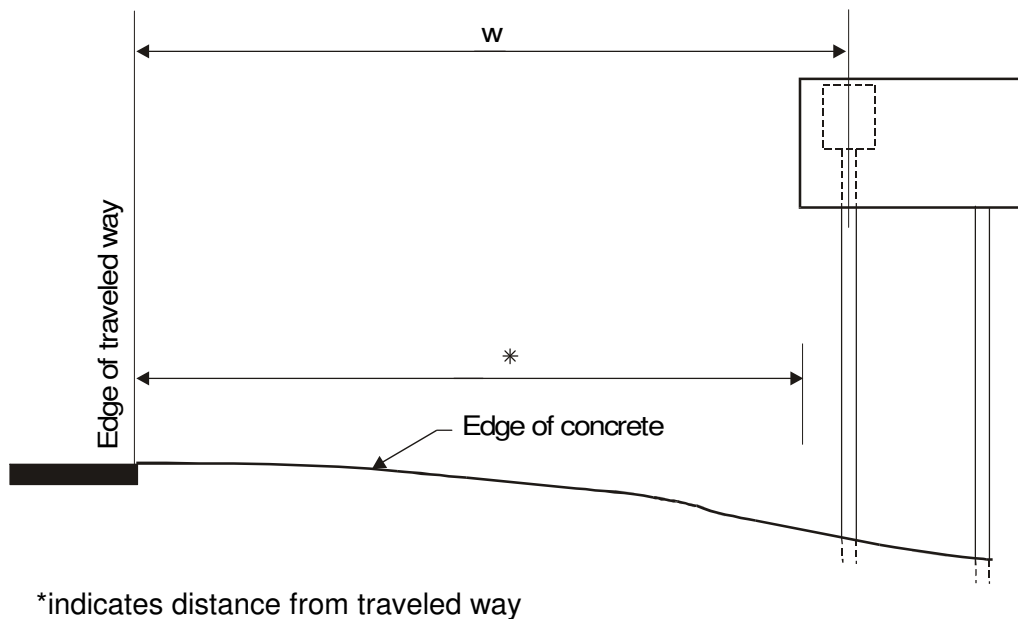


Figure III.1 – Distance from Traveled Way

Legend for each sign. This helps determine if the signs can be reused in the proposed design. Any information that can be obtained in regards to the legend is helpful, including sign shape and color, complete message including symbols, and letter and symbol height.

NOTE TO DESIGNERS:

When obtaining the legends for overhead signs, designers should carefully note and record the locations of existing sign arrows (particularly down arrows), and how they are positioned over lane lines or gore areas. Signs with misleading arrow placement may need to be moved, replaced, or overlaid with revised arrow panels - depending on the condition of the signs and what the planned channelization is in the area of the signs.

Size of Sign. Obtaining the size of signs is important for two reasons. If a sign can remain, the existing sign size needs to be evaluated for the new conditions. Even if conditions in the area remain essentially the same, verify that the sign meets current standards. The second reason for obtaining the sign size is so it may be included on the sign specification sheet as a removal item if the sign is to be removed. (This will be discussed in Chapter VII, "Signing PS&E.")

Sign Material. Most signs have an aluminum substrate. Some have a reinforced fiberglass substrate under the reflective sheeting face. Replace permanent signs which have a wood substrate. Note and replace reflective sheeting backgrounds and legend materials if they do not conform to current standards.

Condition of Sign Face should be noted indicating the type of damage if applicable. Sign faces are considered to be in poor condition and should be replaced when the following conditions affect legibility and readability either in daylight or at night:

- reflective sheeting delamination
- damaged legend
- warping
- fading/weathering
- bullet holes
- bends
- loss of reflectivity - Review this in daylight and at night. If there is a question regarding the loss of sign reflectivity, contact the Regional Traffic Office for an evaluation.
- age of sign (date shown on back of sign)
- other significant damage.

Post type, size and length. Also indicate the number of posts and whether they are notched and/or drilled.

Condition of Posts should be specified indicating type of damage, if applicable. Wood posts are considered to be in poor condition when the following conditions exist:

- Dry rot
- Splintering
- Other significant damage

Metal posts are considered to be in poor condition when the following conditions exist:

- Bent
- Other significant damage.

Vertical Clearance of sign. This is “V” as described in Chapter VI Section A, “Sign Installation - Exact Location.” This vertical distance is measured from the edge of traveled way (edge stripe) to the bottom of the sign.

Video the project area and signs if possible. This will help minimize subsequent site visits as it will allow the viewing of signs, their locations and surrounding features without having to return to the site. If it is not possible to video the area, photograph at least complex sign legends and locations, if not all signs.

Once the inventory has been compiled, illustrate the existing signs on a basemap or transparent overlay. The basemap or overlay will later be compared with the required signing to determine which existing signs need to be evaluated for re-use.

Ground mounted signs and mast arm signs should be replaced with their appropriate replacement sign at 7 years. Signs lose their reflectivity due to sun exposure, which may make signs difficult to read. If signs within a project are under 7 years old use engineering judgment. Signs should always be considered for new posts when updating the signing. Overhead signs should be evaluated for replacement after 15 years.

II. SIGNING PLAN

Once the site visit and sign inventory have been completed, create a preliminary signing plan for the project. To create the preliminary signing plan:

- Determine what signs are needed for the project. Take into consideration standard signing, special circumstances, adjacent projects, and continuity along the highway.
- Lay out required signs on a basemap in their appropriate locations.
- Compare the basemap or overlay of existing signs with the required signs to determine which signs may be appropriate for reuse. Signs noted for reuse will have **to be evaluated based on condition, location, and appropriateness.**

A. SIGNING REQUIREMENTS

There are three main classifications of signs: regulatory, warning, and guide. Guide signs are further segregated into service, recreational, and tourist, which will be discussed after the general guide sign section.

A1. Regulatory Signs

Regulatory signs give notice of traffic laws or regulations. These signs usually have standard messages. A new design for a regulatory sign shall be approved by the State Traffic Engineer. The MUTCD addresses the use of regulatory signs in Section 2B.

Regulatory signs indicate legal requirements to motorists that may not be otherwise apparent. Some laws are only enforceable when they are made known by official signs. Speed limit signs are an example.

Regulatory signs are rectangular with the longer dimension being vertical and have black legend on a white background, except for those signs whose standards specify otherwise, i.e. stop signs, yield signs, etc. Regulatory signs are to be installed at the location where the regulation applies. Stop and Yield signs have special placement requirements that shall be adhered to (see Section F of this chapter, "Preliminary Signing Plan Layout," and MUTCD Section 2B-9).

New installation of stop signs and speed limit signs shall be approved by the State Traffic Engineer (see Chapter 6 of the Traffic Manual).

The Traffic Manual Section 2.3 addresses WSDOT policy for select regulatory signs.

A2. Warning Signs

Warning signs call attention to conditions on or adjacent to a highway or street, that are potentially hazardous to traffic operations. These signs usually have standard messages. In the design of non-standard warning signs, consult with the Regional Traffic Office or if the sign has statewide implications contact the State Traffic Office. The MUTCD does not allow new symbol signs to be developed or existing symbols to be

modified except through the process described in Section 1A-6. The MUTCD addresses the use of warning signs in Section 2C. Special warning signs are discussed in subsequent parts of the MUTCD, as listed below:

Construction & Maintenance	Section VI
School Areas	Section VII
Grade Crossing	Section VIII
Bicycle Facilities	Section IX

Generally, all warning signs addressed in Section 2C are diamond shaped, with black legends on a yellow backgrounds. Before removing any warning sign contact Dave Deede, General Operations. (206)-440-4000

The Traffic Manual (Section 2.4) addresses WSDOT policy for select warning signs.

A3. Guide Signs

Guide signs show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. These signs generally do not have fixed messages, therefore the designer shall determine both the sign message and the sign size. The standards and requirements of guide signs are dependent on the classification of the roadway. WSDOT classifies roadways as either Freeways/Expressway or Conventional. Signing for these two roadway classifications is discussed below.

Freeway/Expressway

A Freeway/Expressway is a divided highway with full or partial control of access. The MUTCD distinguishes between these two classifications; however the WSDOT does not. When designing on a freeway/expressway use both the freeway and expressway sections of the MUTCD, Sections 2-E and 2-F respectively. These sections complement one another with Section 2E focusing on the individual guide signs and Section 2F focusing on the combination and use of guide signs. Unless otherwise specified, guide signs on freeways have white legends on green backgrounds.

Freeway/Expressway guide signs are essential in directing motorists to their desired destination by the use of signs prior to, throughout, and after intersections and interchanges. The major types of guide signs addressed by the MUTCD for freeways/expressways and an example of each are presented below:

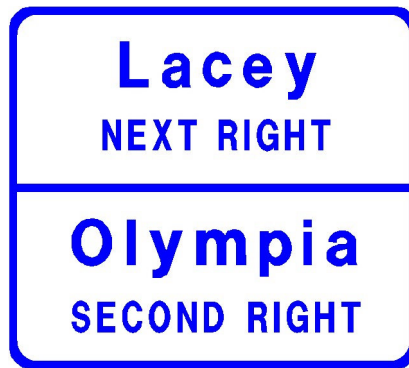
Advance guide signs (MUTCD Section 2E-26) serve as advance notification of interchanges. They display, where appropriate, the exit number, route number, up to two destinations, and the distance to the interchange. They also warn of drop lanes. Advance guide signs are usually located one to two miles prior to the interchange. When interchanges are closely spaced, an interchange sequence series guide sign can be used prior to the first interchange in lieu of advance guide signs at each interchange. In this situation, sign spreading is

very important. When exits are located on the left hand side of the highway, the advance guide sign should be a diagrammatic sign. See also the discussions for advance signing that apply to lane drop “EXIT ONLY” locations (MUTCD Section 2F-25).



E1-1

Supplemental guide signs (MUTCD Section 2E-28) list alternative destinations for the interchange that are not indicated on the advance and exit direction signs. They are located halfway between the advance guide and the exit direction guide. Only one supplemental guide sign may be used on each approach, and it shall be installed independently rather than being added to another major guide sign. To avoid congestion of signs, these signs should only be installed when necessary. WSDOT policies on supplemental destinations are addressed in Section 2.6 B-3 of the Traffic Manual.



E3-101

Next Exit Supplemental guide signs (MUTCD Section 2E-27) can be used to indicate the distance to the next interchange when it is over 5 miles between interchanges. These are installed independently or can be a panel that is installed below the advance guide sign nearest the intersection



E2-1

Exit direction signs (MUTCD Section 2E-29) indicate the direction of departure and restate the information given on the advance guide sign. The exit direction sign and the advance guide sign SHALL have the same message. They are installed at the beginning of the deceleration lane. Arrow placement is on the right side for right hand exits, and on the left side for left hand exits. See also the discussions for "EXIT ONLY" lane drops (MUTCD Section 2F-25).



E6-101

Gore signs (MUTCD Section 2E-30) indicate the point of departure from the mainline and include the exit number, if applicable. These signs are located in the area between the mainline and the ramp.

Pull-Through signs (MUTCD Section 2E-31) are normally intended to be used only when the geometrics of an interchange are such that it is not clear to the driver as to which is the through roadway. There has been a tendency to overuse this type of signing in the past. Install this type of signing only when warranted. Also carefully assess existing pull-through signs to see if they should be removed.

Post Interchange guide signs (MUTCD Section 2E-32) reconfirm the route, speed limit, and distances to designated cities. This series of signs consist of a route marker, speed limit sign and a distance sign and are installed starting 500 feet beyond the on-ramp acceleration lane. See Figure IV.1. Where space is unavailable between interchanges, one or more of these signs may be omitted.

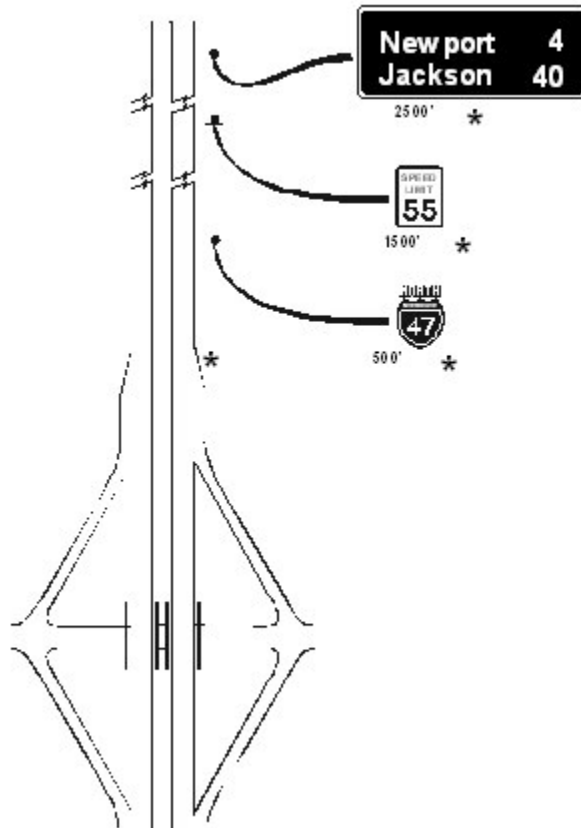


Figure IV.1 – Post Interchange Signing

Interchange Sequence Series guide signs (MUTCD Section 2E-34) display the next two or three interchanges with the distance to each. These signs may be used in lieu of advance guide sign when the spacing between interchanges does not allow for proper placement of the advance guide sign. When interchange sequence guide signs are used, use them over the entire route in an urban area for consistency.

Columbia Exits	
College St	1 1/2
Hanover St	2 1/4
High St	2 3/4

E8-2

Other guide signs range from general motorist information to radio and carpool information, and are addressed in the MUTCD Sections 2E-37 to 2E-43 and 2F-33 to 2F-41.

The MUTCD (Sections 2F-22 through 2F-32) addresses signing requirements and placement for different types of interchanges, including discussions on diagrammatic signs (Section 2F-24), signing of drop lanes (Section 2F-25), and the use of sign spreading (Section 2E-31) which should be utilized whenever possible.

Section 2.6 of the traffic manual addresses general guide sign requirements along with policies for select guide signs.

Conventional Roads

A Conventional road is a street or highway other than a Freeway or Expressway. Usually a conventional road is a two-lane two-way facility with or without access control. The MUTCD address the use of conventional road guide signs in Section 2-D. These signs are essential to guide motorists along highways, to inform them of interesting routes, to direct them to cities, and to identify nearby rivers, forests, parks, and historic sites.

The major types of guide signs addressed by the MUTCD for conventional roads include route markers, destination signs, street name signs, mileposts, general information signs (I Series), and trail markers. WSDOT uses a destination sign different than specified by the MUTCD, as it also includes the route marker (see the WSDOT Sign Fabrication Manual signs D1-801 and D1-901 for specifics).



D1-801

The use of route markers is discussed further in the Section 2.5 of the Traffic Manual. Section 2.6 addresses general guide sign requirements and policies for select guide signs.

A4. Specialized Guide Signs

Motorist service signing, recreational and cultural interest area signing, and signing for civil defense are considered guide signs, but are presented in separate parts of the MUTCD. Motorist service signing is divided into two sections: general motorist services and specific service signing.

General Motorist Service Signs

General motorist service signs are also known as “generics”. They are non-logo guide signs for motorist services recognized by Sections 2E-37 and 2F-33 of the MUTCD. In order to justify the installation of general motorist services signs, the business’ facility must meet or exceed the minimum specification listed in Chapter 2, Section 6 of the Traffic Manual (Section 2F-33 of the MUTCD). In the Northwest Region, these signs are typically installed when the demand for specific service signs exceeds the available sign spacing requirements around an interchange or intersection. Also, a single generic service sign can be used for multiple consecutive interchanges. Finally, do not combine general motorist signing and specific service signing on one installation at an interchange or intersection.

Motorist Information Sign (MIS) Program

The Motorist Information Sign (MIS) program falls under the category of specific service signing. Motorist information signs (also known as panels or backboards) provide travelers with business identification and directional information for essential motorist services.

The MIS program allows signs for the activities of gas, food, lodging, camping, recreational, and tourist oriented directional (TOD). For the activities of gas, food, lodging, camping, and TOD: the panels consist of white legends on blue backgrounds.

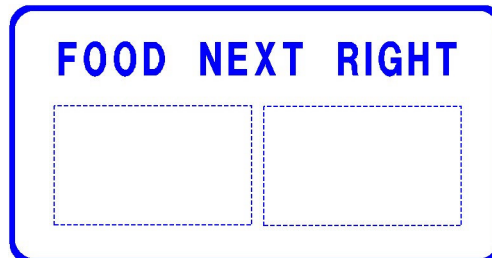
Recreational activity panels have white legends on brown backgrounds. The Northwest Region convention regarding the MIS backboards is "name of activity" NEXT RIGHT or "name of activity" NEXT LEFT rather than "name of activity" NEXT EXIT 123.

A business sign (logo) is a single sheet of aluminum with reflective sheeting that is posted to the larger motorist information sign.

In addition to the MUTCD, Chapter 468-70 WAC and Chapter 47.36 RCW govern the program as well. With respect to Sign Designers, the following parameters are the most frequently encountered: For interchanges, the maximum number of business signs per panel is six. However, the maximum number of business signs per panel is four for intersections. Recreation activity panels are not permitted along the state routes of the Interstate system. The order of panels from closest to farthest from the intersection or interchange is gas, food, lodging, camping or recreation, and TOD. Off ramps have the same presentation as the mainline signing.

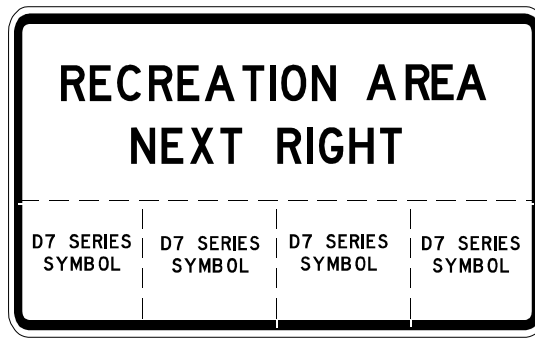


Motorist Service Signing (D9-103)



Motorist Informational Services (LG-M3)

Recreational and cultural interest area signs are used to direct motorists to facilities, structures, and places, and to identify various services available to the public. These signs have white legend on brown backgrounds. Section 2-H of the MUTCD discusses the use of these signs. The Traffic Manual addresses WSDOT policies on these signs in Section 2.6 D-11.



D7-7701



LG-M9

B. SPECIAL CIRCUMSTANCES

Due to special circumstances of the project site and its vicinity, some standard signs may need to be omitted or modified, or additional signs may need to be added. Since each project site is unique, engineering judgment will be required to determine if any special circumstances exist, and if so, what actions need to be taken. Examples of special circumstances could include space limitations for installing signing or signing needed for state parks, shopping malls, prisons, colleges, schools, etc.

When special circumstances are encountered, review the MUTCD and the Traffic Manual, to determine if any documented guidance is available. Section 2.6 of the Traffic Manual explains WSDOT policies, expands on the use of guide signs discussed in the MUTCD and addresses guide signs not included in the MUTCD. Chapter 7 of the Traffic Manual gives information on additional special uses.

C. CONTINUITY

When developing the preliminary signing plan, consider the overall continuity of the highway. Be aware of the signing scheme along the entire route to ensure that the design will blend with the remainder of the route. For example if interchange sequence signing is used, it shall be continued for interchanges along the route until a logical break point is reached to revert to standard advance guide signs.

Continuity should also be considered when selecting sign support structures, which will be addressed in Chapter VI, "Sign Installation."

D. ADJACENT PROJECTS

When developing the preliminary signing plan, take into consideration current and future adjacent projects that might affect the signing. Do not focus solely on the project under development, but also be aware of existing and proposed signing beyond the project limits in both directions. Check with the Regional Design Engineer or Plans Engineer to determine if other projects are under development or planned for the near future in the proximity of the project site. If there are other projects adjacent to the project site, consider the impacts that each project will have on the other. Address not only the signing scheme, but also coordination of the sign locations (particularly for large sign structures, such as sign bridges) to avoid duplication, or unnecessary sign relocation. When there are currently two or more adjacent projects, it is best to design the signing for the entire roadway section, and then break it out into the separate projects. This will ensure proper spacing, consistency and continuity between the projects.

E. TEMPORARY SIGNING

Along with the preliminary plan for the design, give thought to the temporary signing that will be required during construction. Work zone traffic control signing consists of construction warning signs and necessary regulatory signs to provide a safe marked path through the construction project. Work zone signing is not addressed in this design guide, but is discussed in Section VI of the MUTCD. Other temporary signs that may be required include standard regulatory, warning and guide signing of temporary roadways or roadways that will have a change in operation for an extended period of time. The MUTCD requires that all necessary signing be in place prior to the opening of new highways, detours, or temporary routes and that signing required by a certain condition or restriction be removed as soon as that condition or restriction ceases to exist. If it is not economical to remove signs not needed during construction, they shall be covered. It is also required that signs on roadways that are not yet open to the public be covered.

Coordinate with the roadway designer to determine the construction sequencing of the project and determine what temporary signing will be needed. Confirm that temporary signing and permanent signing will not contradict one another.

Consider how to display essential messages when existing signs are to be removed. Include provisions in the signing plan to ensure that at a minimum, warning and guide signs are displayed to the motorists during construction. Since warning signs depict roadway conditions, many of these signs will be replaced by work zone traffic control signs during construction. Guide signs, however, do not usually get replaced by work zone signs. Since guide signs are essential in meeting motorists expectations by navigating them to their destinations, provisions shall be made to maintain guide sign messages during the project.

When existing signs are to be replaced, the new sign should be installed and visible prior to the existing sign being removed. Other situations may require overhead signs being temporarily ground mounted, or ground mounted signs being placed on temporary overhead structures. Use engineering judgment to determine the most efficient method for displaying essential messages through out the construction of the project.

F. PRELIMINARY SIGNING PLACEMENT

The preliminary signing plan should be laid out on a basemap to indicate what signs will be used and their approximate locations. This will help determine if sufficient spacing for all required signs is available and will help in visualizing the signing scheme. Take time at this point to review Section II-A of the MUTCD.

When laying out the preliminary signing plan it is important to consider not only the visibility of sign messages themselves, but how the signs and their support posts may affect the ability of drivers to see and react to other traffic. This includes trying to keep large signs out of the sight triangle of intersections, and giving thought to the vantage point of bus or truck drivers who sit much higher than conventional vehicle drivers.

As a motorist drives through the completed project area, the signing scheme should be such that the driver is safely guided to desired destinations. The intent of signs is to direct and assist unfamiliar motorists in the guidance and navigational tasks required to safely travel any roadway open to the public. Care should be taken not to install too many signs as information overload can cause confusion, impair safety, and cause a disregard of all signing.

Guide signs are usually laid out first, even though regulatory and warning signs have priority. Once the guide signs have been located the regulatory and warning signs are considered. If a regulatory or warning sign is required at the same location that a guide sign has been located, the guide sign may need to be moved or eliminated if possible. If possible, consider adjusting the location of the regulatory or warning sign to fit in with the guide sign spacing, except for stop and yield signs whose location is critical. As a last resort consider installing a warning or regulatory sign on the support structures for overhead signs as long as the messages on the signs are not complicated or complex. (Figure IV.2). Avoid placing any signs with complex messages close together. See Chapter VI Section D, "Overhead Sign Structures" for regulations on the number of signs at one location.

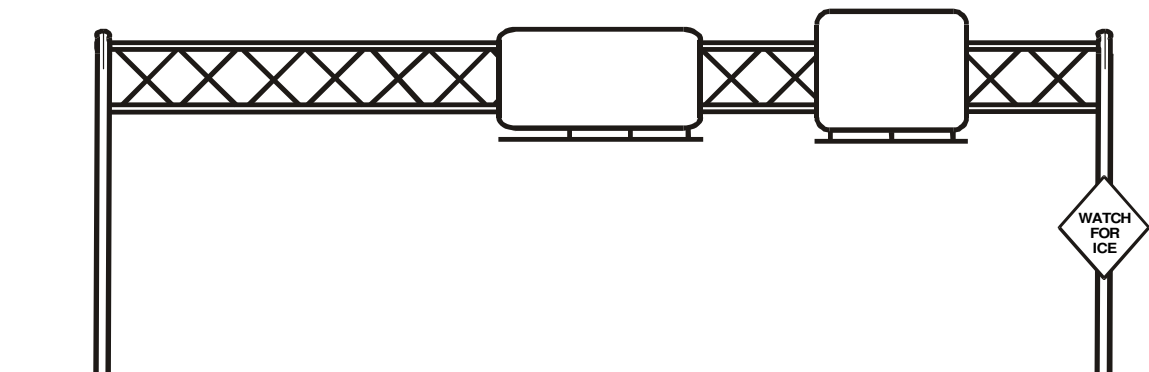


Figure IV.2 – Sign Bridge

F1. Guide Signs

Guide signs are generally considered first as they contain the most information, therefore require the most interpretation and decision making time. Due to the generally large size of the signs they also require the most space for installing.

F1.A SELECTION

The first step in laying out the guide signs is to determine which signs will be required by the project. The different types of guide signs and applicable MUTCD sections were previously discussed in this chapter under Signing Requirements. Now select which signs will be used for the project.

First identify the type of roadway being signed (freeway/expressway or conventional), then identify all interchanges or intersections within the project limits. Signing for interchanges constitutes the majority of all guide signs, therefore concentrate on them first.

Signing required by interchanges on freeways/expressways is based on the class of interchange. The MUTCD separates interchanges into different classifications and gives the signing requirements for each. Table IV.1 lists the different classifications and the corresponding MUTCD sections and figures.

Table IV.1 MUTCD Section by Interchange Classification

<u>Classification</u>	<u>MUTCD Section</u>	<u>MUTCD Figure</u>
Interchange Between Two or More Freeways	2F-23	2-27 through 2-31
Cloverleaf	2F-26	2-36
Cloverleaf with Collector Distributor Roadways	2F-27	2-37
Partial Cloverleaf	2F-28	2-38
Diamond	2F-29	2-39
Urban Diamond	2F-30	2-40
Closely Spaced Interchanges	2F-31	2-41
Minor Interchanges	2F-32	2-42

Each of the figures mentioned in Table IV.1 show the required interchange signing along with their order and approximate location. Uniformity in the use of these signs is very important in meeting driver's expectations. These figures do not show, however, any supplemental or miscellaneous guide signs. The use of supplemental signs is location specific and shall be based upon WSDOT policies as stated in the Traffic Manual Section 2.6 B-3 and engineering judgment.

Specific service signing, or motorist information signs (MIS) as called by WSDOT, are originally installed upon request by a business and approval by WSDOT. The blue background of the MIS is supplied by the WSDOT, while the specific service sign (the logo) is supplied by the business. Contact the Regional Outdoor Advertising Specialist regarding MIS requests within the project limits or any MIS sign requirements.

Once the Interchange and Intersection signs have been laid out, complete the guide signs for the remainder of the route. A few of these signs may be mileposts, distance signs, miscellaneous guide signs such as radio information, tourist information, scenic signs, city entrance markers (see Traffic Manual 2.7 E), seatbelt signs, etc. Refer to the MUTCD and the Traffic Manual for specific criteria for each type of sign.

While selecting the guide signs to be used, remember that these signs are solely for the purpose of motorist guidance and are not an advertising medium.

F1.B LOCATIONS

Guide signs will need to be shown on the preliminary plan in their approximate location. The *actual* locations will be determined when preparing the contract plans. Doing this will aid in determining if there is room for the signs to be spaced correctly. If adequate space does not exist, a decision will have to be made with regards to adjustments of sign locations and of sign existence.

+

Refer to the MUTCD and WSDOT Traffic Manual for locations of guide signs. The spacing of guide signs should be such that the driver has adequate time to read and respond to the messages, as was discussed in Chapter 1 Section E-2, "Human Abilities". It has been determined that all major guide signs should be spaced at a minimum of 240 meters (800 feet) apart (MUTCD Section 2E-25 and Traffic Manual 2.6). If the project does not include MIS signs at freeway interchanges, consider leaving enough room for them to be installed in the future. If adequate spacing for "advance" guide signs cannot be achieved, interchange sequence series signing may be used instead. Miscellaneous guide signs such as route markers, mileposts, informational signs (I series), etc. are not considered major guide signs and can usually be read with just a glance, therefore they do not need to meet the above spacing requirements.

Even though the actual location of the sign will not be determined until the preparation of the contract plans, the preliminary plan still needs to reflect placement of signs in consideration to feasibility of location and sight distance. Some locations within a project area may be impractical for sign installation due to retaining walls, shoulder drop-offs, or other special circumstances. These are usually substantial features and are easy to identify with an initial site visit or basemapping.

Overhead Structures

This is also a good time for the designer to determine if guide signs shall be installed overhead or ground mounted. Overhead installation can greatly improve sight distance. Section 2A-22 of the MUTCD lists conditions to be considered for overhead installation. Guide signs containing the "Exit Only" plaque for drop lanes shall also be installed overhead per MUTCD Section 2F-25. Other elements such as continuity of route, safety of motorists and cost shall be considered when making decisions of overhead versus ground mount installation. Cost includes not only the cost for the sign structure but also required protection and traffic control for lane closures during installation and maintenance. If overhead structures are chosen, refer to the MUTCD Sections 2E-8 and 2E-17 for further requirements.

When dealing with a complex signing scheme, or when unsure of the guide sign placement, have the Regional Traffic Engineer review the guide sign plan layout. Guide sign plans may also be sent to the State Traffic Engineer's Office at the OSC for review.

F1.C FOLLOW-THROUGH SIGNING

When installing guide signs or motorists information signs for destinations off the state highway system, follow-through signing is needed on the local roadways to direct motorists to their destination. For example, when signing to a port district industrial area that is not directly adjacent to the highway, the signing must be installed on the local roads leading the motorist to that area. This signing is installed and maintained by the local agency responsible for the roadway system and must be in place prior to installing the guide signs on the highway. Coordinate with the local agency for installation of follow-through signing. If follow-through signing is not installed on the local roadway system, the guide signs cannot be installed on the highway.

F2. Regulatory and Warning Signs

Once the guide signs have been laid out, insert the regulatory and warning signs into the plan. Warning signs that require flashers, see Electrical Current Practices.

F2.A *SELECTION AND LOCATION OF SIGNING*

Regulatory and warning signs, commonly referred to as “control signs,” need to be selected based on regulations and hazards of the project site. This selection is not as procedural as for guide signs. Identify each regulation or hazard throughout the project and ensure that it is appropriately signed. Regulations within the project limits may include speed limits, stop or yield control, or lane use restrictions. Hazards may consist of curves, merging lanes, low or lateral clearance infringements, or an obscured intersection. On multi-lane highways that exceed two lanes in one direction, install warning and regulatory signs on both sides of the roadway.

Insert the regulatory and warning signs into the preliminary plan layout with the guide signs. Refer to the MUTCD and Traffic Manual when locating these signs. When the desired location of a sign falls at the same location of a guide sign, or close enough to a guide sign that one of the signs is obstructed by the other, determine if either of the sign locations can be adjusted without violating spacing requirements or specific signing requirements. Consider adjusting the warning and regulatory sign locations first, but if the sign cannot be moved, adjust the guide sign. This adjustment may also affect the locations of the other signs on the preliminary plan. Determine the best location for each sign, and if necessary the best compromise for each situation.

(1) Regulatory Signs

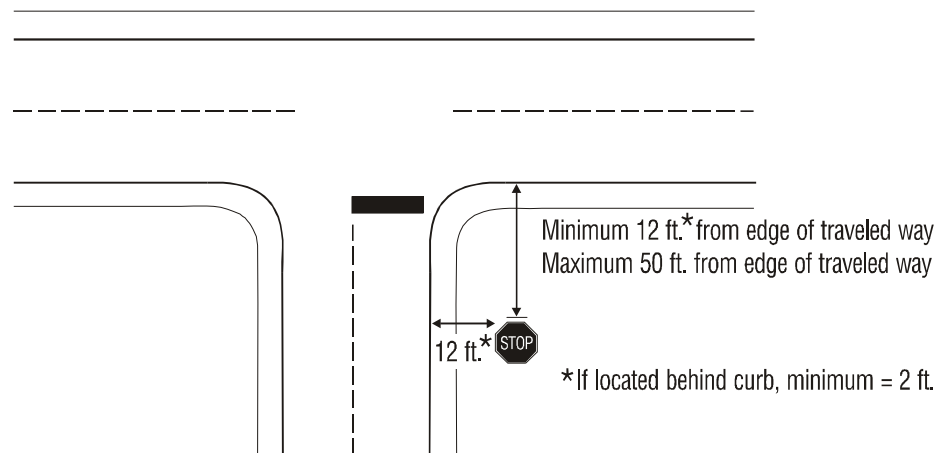
Regulatory signs are needed to inform motorists of regulations or restrictions that would not be apparent otherwise. The selection and placement of these signs are based on restrictions and regulations of the project being constructed. Review Section 2B of the MUTCD to verify that all needed regulatory signs have been utilized.

The usage and placement of select regulatory signs are discussed below.

Stop and yield signs (MUTCD Sections 2B-4 through 2B-9 and Traffic Manual 2.3I) are used to control traffic at unsignalized intersections. According to the MUTCD, these signs should only be used where warranted (warrants are located in Section 2B-5 and 2B-8 of the MUTCD). However, State law requires that stop or yield signs be used on all streets approaching arterials or highways. Stop signs for private road approaches are the responsibility of the property owner and shall be installed and maintained in accordance with the MUTCD, per RCW 47.32.160 and the Special Provisions of the Road Approach Permit. To stop traffic on a state highway, approval shall be received from the State Traffic Engineer in accordance with Section 6.4 of the Traffic Manual.

Locate stop signs at the actual location where the motorist is to stop. Locate yield signs where the motorist would stop if necessary to yield the right-of-way. See Figure IV.3 below or MUTCD Figure 2-2 on page 2A-15 for stop and yield sign locations at different types of intersections. The minimum distance from the sign to the traveled lane is to be no less than 12 feet, unless installed behind curbing, in which case the minimum distance is 2 feet from the face of the curb. The maximum distance between the sign

and edge of traveled way of the intersecting roadway is 50 feet. Figure 2-2a of the MUTCD shows stop and yield signs use when the major traffic flow is a turn movement.



STOP SIGN LOCATION

Figure IV.3

The locations of the stop signs (or bars) need to be field confirmed based on sight distance. The Design Manual gives requirements for sight distance based on the design speed of the through roadway. The sight triangle created by the sight distances to each direction of the stopped vehicle must be obstruction free. If it is not, adjust the stop sign, while remaining within the 12 ft. to 50 ft. requirement, or clear the obstructing features.

Speed Limit signs (MUTCD Section 2B-10 and Traffic Manual Section 2.3F and G) are required both to remind motorists of the speed limit and to notify of any changes of speed limit. Speed limit signs are installed after interchanges or major intersections to remind motorists or inform motorists who have just entered the roadway of the speed limit. On freeways/expressways, speed limit signs are part of the post interchange signing (MUTCD Section 2E-32). Speed limits on new roadways or a change of speed limit on existing facilities shall be approved by the State Traffic Engineer.

When there is a change in speed limit, the signs are to be located at the actual point of the speed limit change. Contact the Regional Traffic Office for the official point of speed limit change. Place the signs directly across from each other whenever possible, however, if necessary, they may be offset by up to 150 feet. Avoid placing speed limit signs between a curve warning sign with an advisory speed plaque and the curve. This may give the false impression that the curve can be safely maneuvered at the posted speed limit instead at the advisory speed.

When the speed limit is being lowered, a Speed Zone Ahead (MUTCD 2B-14) sign with an advisory speed plaque (sign number R2-501) should be used. It should be located in advance of the speed limit sign at a minimum distance as recommended in the MUTCD Table II-1, condition C, with the desirable speed equal to the new speed limit. See Figure IV.4. The speed zone ahead sign should be at a location far enough in advance of the speed limit sign to allow the motorist to slow to the new speed without braking.

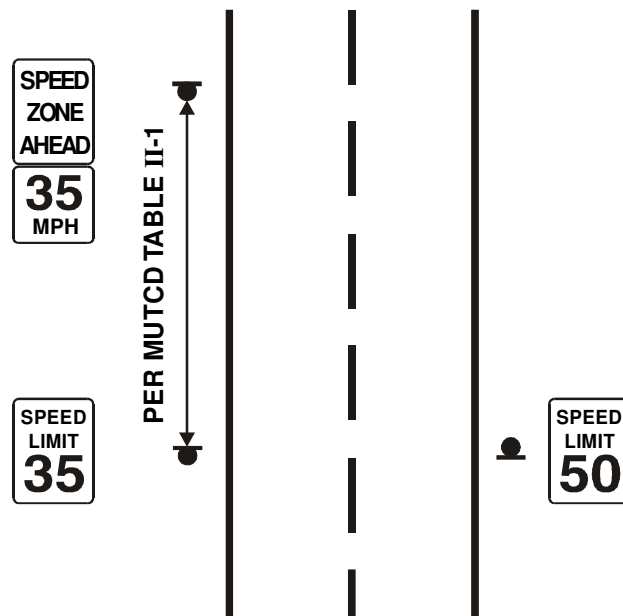


Figure IV.4 - Speed Limit and Speed Zone Ahead Sign Placement

Lane Use Control signs (MUTCD Sections 2B-17 through 2B-18) require turns for a particular lane or permit turns from a lane that would not otherwise be apparent. These signs can be ground mounted or installed overhead. When mounted overhead, these signs are to be located over the lane that they pertain to. At complex traffic signals, these signs may be installed on the signal mast arm next to the appropriate signal head.



R3-5

Traffic Signal signs (MUTCD Section 2B-37) supplement traffic control by giving instructions to pedestrians and motorists. MUTCD sign R10-4b (WSDOT sign R10-4001 or R10-4002) is used by WSDOT at all crosswalks having a pedestrian push button. These signs are installed on the signal pole on each side of the pedestrian push button. See Standard Plan J-5 for pedestrian pushbutton signs are usually included in the traffic signal plans or specification, therefore do not need to be included in the signing PS&E.

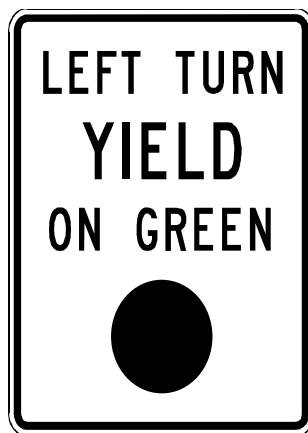


R10-4001



R10-4002

Sign R10-12 may be used for protective/permissive left turns at signals. This sign is installed on the mastarm next to the left turn signal head, and is normally 30" x 36" in size. See Chapter VI - Sign Installation for mounting information. The remainder of the traffic signal signs are used for reinforcement when the particular requirement of the sign exists. These requirements will be based on signal operation characteristics as determined by the traffic signal designer. Standard Plan J-7a shows the modified R10-6 sign used at ramp meters.



Wrong Way (MUTCD 2B-27), Do Not Enter (MUTCD 2B-26), One-Way (MUTCD 2B-29), and Turn Prohibited (MUTCD 2B-15) signs tend to be used in combination with one another at intersections of one-way streets and highway ramps. The typical sign configuration for use at intersections with one-way streets are shown in Figure 2-3 through 2-4 of the MUTCD and Appendix B. Appendix B also shows the typical configuration for signs at ramp termini.

HOV (high occupancy vehicle) signing is briefly discussed in the MUTCD Section 2B-20 "Preferential Lane Signing". However WSDOT policy on HOV signs is located in the "HOV Design Guide - for the Northwest Region." For a copy, contact the Northwest Region Traffic Office.

Shoulder Driving (Traffic Manual Section 2.3D and Appendix 2-3) and Slow Vehicle Turnout (Traffic Manual Section 2.3E and Appendix 2-4) signs are used when these individual conditions exist. The roadway engineer determines the appropriate use and design of these features according to the Traffic Manual, Chapter 7, and the Design Manual. These signs are not included in the MUTCD, but are addressed in the above referenced sections and appendices.

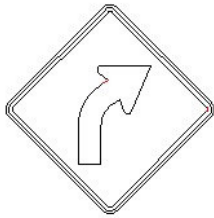
(2) Warning Signs

Warning signs are needed to inform motorists of existing or potential roadway hazards. The selection and placement of these signs are based on the particular hazards and their locations. Most warning signs are placed in advance of the hazard, at a distance no closer than the prescribed in Table II-1 of the MUTCD, however some signs such as object markers are located at the hazard. If signs require mounted flashers, see Electrical Current Practices Manual.

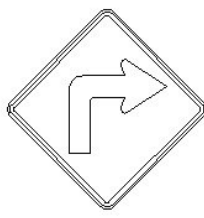
The usage and placement of select warning signs are discussed below. These signs should be located according to Table II-1 of the MUTCD unless otherwise noted, as discussed in Chapter 1 Section E-2, "Human Abilities".

Curve and Turn signs (MUTCD Sections 2C-4 through 2C-8 and Traffic Manual 2.4I and 2.4P) are installed when an engineering study indicates that the recommended speed is 5 MPH or more below the posted speed limit. Contact the Regional Traffic Office to obtain the appropriate recommended speed for new roadways and possible revisions or updates to existing roadway curve speeds. The type of curve sign to be used depends on the recommended safe speed of the curve and the number of consecutive curves. When the recommended curve speed is 30 mph or less use the Turn sign (W1-1). When the recommended speed is over 30 mph use the Curve sign (W1-2). When there are consecutive curves in opposite directions separated by tangents of less than 600 feet use the Reverse Turn (W1-3) or Reverse Curve (W1-4) sign depending on the recommended speed. When the recommended speed is 10 MPH or more below the posted speed limit, use an Advisory Speed plaque (MUTCD Section 2C-35 and Traffic Manual 2.4P) installed below the turn or curve sign. These requirements for turn and curve signs and advisory speed plaques were established in the December 12, 1997 memo from Dave Peach, (see Appendix C) and supersede the Traffic Manual and MUTCD. See Figure IV.5

W1-2R



W1-1R



W13-1



W13-1



40

25

45

20

50

(higher as indicated by engineering study) (lower as indicated by engineering study)

Figure IV.5 – Speed Advisory

Chevrons and large Arrow signs (MUTCD Sections 2C-9 and 2C-10, and Traffic Manual 2.4B) can be used at the curve to supplement the curve sign. Chevrons, large arrow, or a combination of both may be used. For additional positive guidance, an advisory speed plaque may be installed below a chevron or large arrow sign. The arrow and chevrons should be installed on the outside of the curve with a minimum 500 feet of visibility. When using chevrons, install a minimum of three chevrons, with two chevrons visible at all times through the curve, see Figure IV.6. Contact the Northwest Region Traffic

Operations Office for advice regarding placement of curve chevrons and large arrow signs.

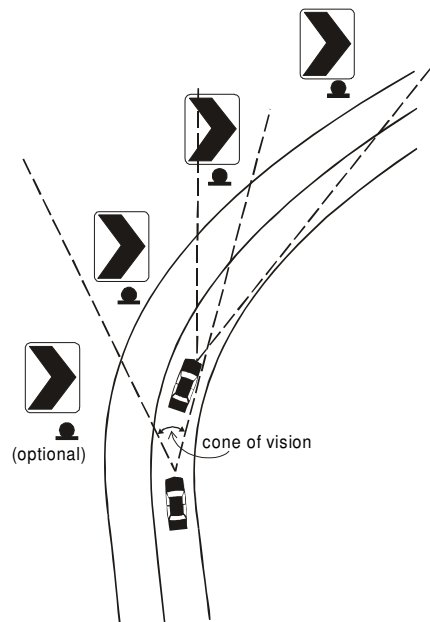


Figure IV.6 - Chevron Placement

Advisory Exit Speed signs (MUTCD Section 2C-36 and Traffic Manual 2.4D and 2.4E) advise motorists of the maximum speed that the ramp can be comfortably negotiated. There are two signs that can be used, either W13-2 or W13-3 depending on the type of ramp (see Traffic Manual for description). When an existing ramp is being signed, check with the Regional Traffic Office for updates or revisions to the recommended speed. When a new ramp is being constructed, use the design speed of the ramp until the ramp is built and the advisory speed can be confirmed by ballbanking. Note in the plans, to contact the Regional Traffic Office for verification of actual advisory speed and revise the sign if necessary.

Do Not Enter signs at freeway off ramp terminals shall be 48"x48" and the STOP sign shall be 36"x36". They both should be mounted at 7' and can be mounted back to back.

Cross Road and Side Road warning signs (MUTCD Sections 2C-11 and 2C-12 and Traffic Manual Section 2.4K) are normally used in advance of obscured intersections. They are also sometimes used in advance of problem intersections. A field engineering investigation may be desirable for some intersection locations to determine if these signs are warranted. The need for Cross Road or Side Road warning signs at specific locations should be verified by contacting the Northwest Region Traffic Operations Office. When used, Cross Road and Side Road warning signs are located per MUTCD

Table II-I condition B. D3-201 signs (black on yellow road name signs) may be placed below the intersection warning sign to supplement it.

Where a cross or side road warning sign is not warranted, a D3-302 road name sign may be installed in advance of the intersection, in addition to the standard road name sign (D3-101) located at the intersection. The sign can be modified with a chevron or an arrow. Check with Special Operations for current warranted criteria when placing new advanced warning signs.

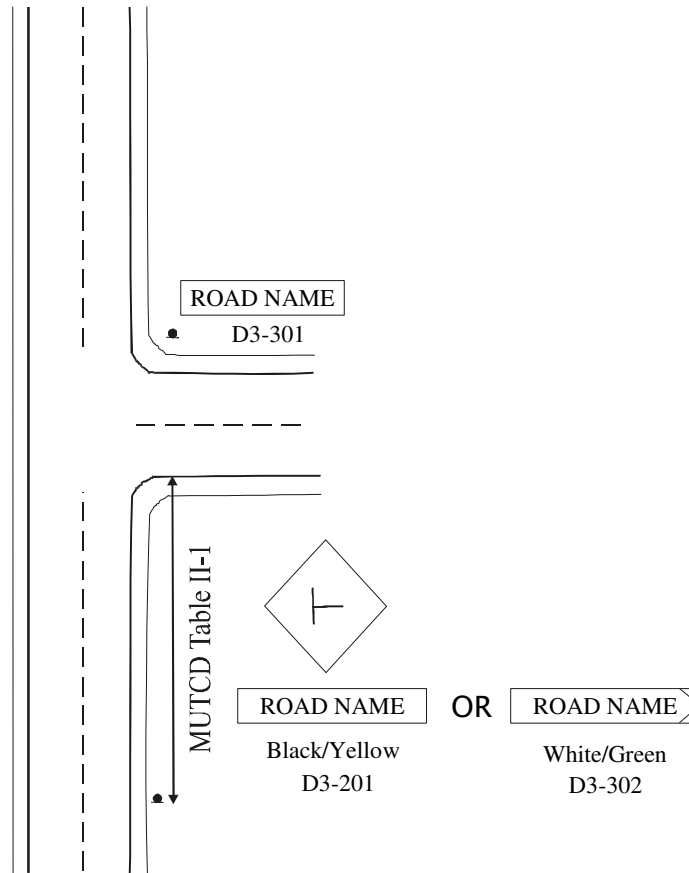


Figure IV.7 – Cross Road Signing

Table IV.2 presents letter sizes to be used for street name signs and advance street name signs.



Table IV.2 - Letter Sizes for Advance and Street Name Signs

Lane Type	Speed Limit (mph)	Street Sign Minimum Letter Size	Advance Sign Minimum Letter Size	Sign Fab. Numbers
Single	25-30	6" D	NA	D3-101, 102
Single, Multi-Lane	35-45	6" D	6" D	D3-101*, 102 D3-301, 302**
Single, Multi-Lane	50+	6" D 8" D	8" D	D3-101*, 102 D3-301, 302**

For advance locations associated with a crossroad warning sign use a D3-201.

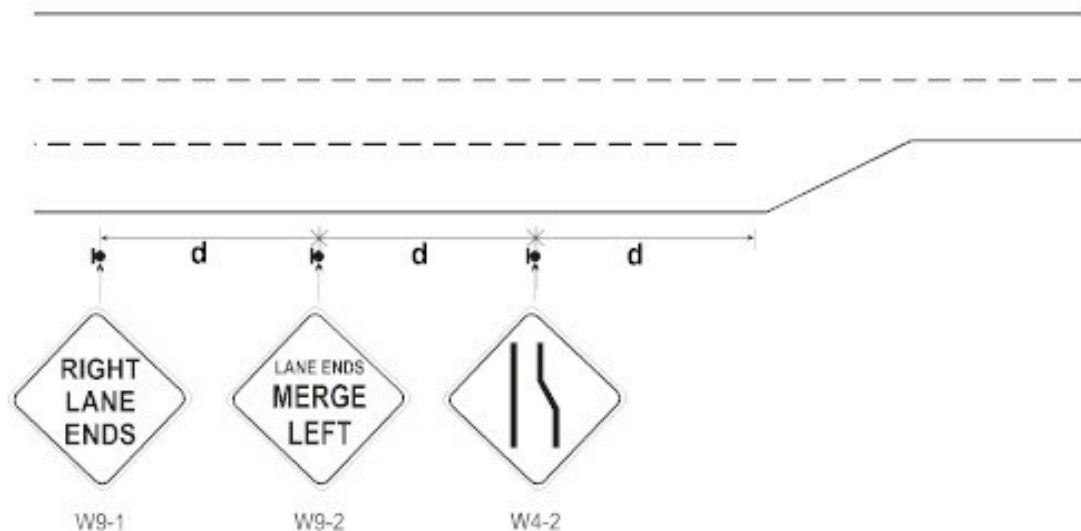
*The 8"D and 6"D letter size combination is an option for signs mounted on signal mast arms or advance locations.

**Modify to use 8"D letters and increase the sign height to 18" for one line or to 30" for two lines. (Advance Only)

- Shoulder mount street name sign length should be 54 inches or less.
- When city streets are part of the state highways, the appropriate city shall install and maintain the street name signs if the population of the city is over 22,500 within the corporate limits. NOTE: An exception to the above criteria is when a street name sign is attached to a signal pole that is owned and maintain by WSDOT.
- When county roads intersect state highways, the counties are responsible to install street name signs (above WSDOT's stop signs), and then by agreement WSDOT will maintain the signs.
- Private street name signs (D3-104) are the responsibility of the property owners to install and maintain via a general permit with the local maintenance area unless the WSDOT project impacts the sign(s) by widening. The NWR Traffic Operations Group has developed a typical sign layout drawing that should be included with the general permit. Contact NWR Traffic Operations Group.

Lane Reduction signing (MUTCD 2C-19), which may consist of up to three signs, is used to warn of a reduction in travel lanes. The lane reduction symbol, sign W4-2 is required in advance of the taper at a distance per MUTCD Table II-1. MUTCD Figure 3-10, page 3B-13, shows typical lane transitions. The Right (Left) Lane Ends sign (W9-1) and Lane Ends Merge Left (Right) sign (W9-2) are both supplemental signs. Some factors influencing the use of these supplemental signs may be speed limit, visibility of

transition, length of tangent, etc. When these supplemental signs are used, place them in advance of the lane reduction symbol per MUTCD Table II-1. See Figure IV.8.



d is defined by Table II-1

Figure IV.8 – Lane Reduction Signing

Low Clearance signs: – The maximum legal vehicle height permitted on state highways is 14' (RCW 46.44.020). At the direction of the MUTCD, and through operational experience, a 15" buffer (including 3" for frost heave) has been added to the 14', creating a maximum threshold of 15'-3" for low clearance warning signs.

Lateral Clearance Markers (MUTCD Section 3C), WSDOT sign number W12-401R/L, which are called type 3 object markers in the MUTCD, are used to mark obstructions within or adjacent to the roadway. They are used for features such as bridge piers, narrow shoulders, islands, longitudinal barriers, or other objects that encroach on the shoulder width compared to adjacent roadway sections. Lateral clearance markers shall be installed so the edge of the marker closest to traffic is in line with the inner edge of the obstruction, with the stripes pointing down towards the roadway. See Figure IV.9. The mounting height to the bottom of the sign is 4 ft. above the lane edge.

Highway Advisory signs - Sign Design needs to be informed if HAR's are needed or required. If so, they will be mounted overhead for 2 or more lanes of traffic. If one lane, shoulder mount in the same direction.

Attention Flags: When determined necessary attention flags will be mounted on the both top corners of the sign. If the sign is 9 sq. ft. or smaller use 12" x 12" florescent flags. When the sign is greater than 9 sq. ft use 18" x 18" flags.

Signal Ahead Flashers: see NW Electrical Design Current Practices Manual



Figure IV.9 – Lateral Clearance Marker

(3) Combination of Regulatory and Warning Signs

Some situations such as auxiliary lane signing (Traffic Manual 2.3B) and school signing will require a combination of regulatory and warning signs.

School signing is addressed in the MUTCD, Section VII, and in the Traffic Manual, Section 2.7N. This signing may include advance school warning signs, school crosswalk warning signs, school bus stop ahead signs, school bus turnaround signs, school zone and speed limit signs. Any new school bus signing for Northwest Region must be approved by the Northwest Region Traffic Operations Office.

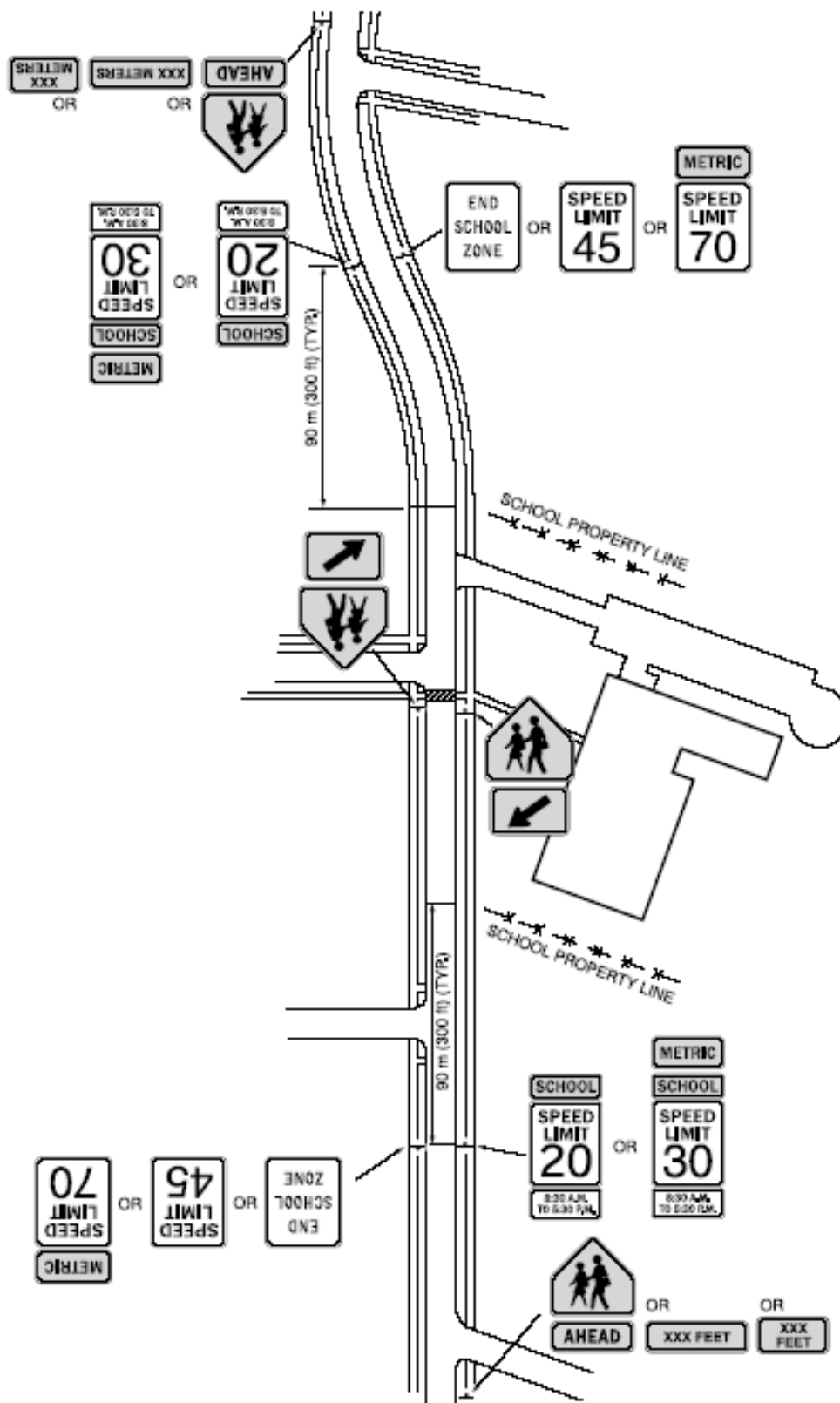


Figure IV.10 – School Crosswalk Signing

S1-1 will be used in school crossing zones and W11A-2 will be used as a pedestrian warning sign in non-school zones. Crosswalk signs are supplemented with an arrow (W6-7P). Sign S2-1 are no longer used. The school zone speed limit sign in the picture above with the option time plaque below it is placed at a maximum distance of 300ft from the school property line.

G. EVALUATION OF EXISTING SIGNS

Once the sign layout has been developed, compare it to the existing sign map that was developed from the inventory, to determine which signs can be reused. Waiting until this point to compare the two will avoid duplicating any incorrect signing schemes that already exist. Only existing signs identified for reuse will need to be evaluated. Base evaluation on message, condition, adherence to current standards and legal requirements, location and illumination properties. Remove signs that are not appropriate for the new design.

- Message - Confirm that the message on the existing sign is suitable for the new design. Remove all signs whose message is inappropriate.
- Condition - To be in adequate condition, signs must be legible and readable in daylight and at night. Replace signs according to Chapter III Section D of this manual, "Project Inventory of Existing Signs," or if in questionable condition.

If the sign is in good condition but the post(s) is in poor condition, reinstall the sign onto new posts. Posts may be reused as long as they are the correct size for the new sign and are in good condition. (See Chapter VI, Section B "Post Mounting")

- Meeting current standards - Existing signs considered for reuse shall meet all current standards.
 - ⇒ Legend shall conform to all current standards in terms of symbols, text, layout and color. Some specific items to check are the correct symbol is used instead of obsolete text, or that Exit Only panels for drop lanes are black on yellow.
 - ⇒ Make sure that the sign and legend size are correct for the posted speed limit. Standards and speed limits change over time and existing signs may not meet current standards for the conditions.
 - ⇒ Post size shall be confirmed for signs that are to be reused, or if considering putting a new sign on existing posts.
- Mounting Height - Verify that the mounting height is correct for the new roadway. Even if the roadway elevation does not change due to construction, the mounting height may be lower than standards, which could be potentially hazardous (see Chapter VI "Sign Installation").
- Safety Features - Breakaway posts are a very important safety feature. All existing posts considered for reuse shall have breakaway features, be behind longitudinal barrier, or be outside the clearzone (see Chapter VI "Sign Installation"). Existing wood posts without breakaway features may need to be drilled (and notched if multi-post installation) per Standard Plan G-4a. Signs on steel posts without breakaway

features need to be protected, relocated out of the clearzone, or reinstalled on posts with breakaway features.

- Location - If the sign is not in the appropriate location longitudinally due to sign spacing or sight distance, or if it is not located correctly laterally then the sign needs to be relocated. If a sign under 20 square feet is to be near a light standard, then install it on the standard. This will “clean up” the appearance of the area by eliminating unneeded signposts. No roadway luminaries shall be within 50 ft of the front of an overhead sign installation. Do not reuse existing posts when relocating signs, as they may be damaged during removal.
- Illumination - Overhead signs shall be checked for conformance with illumination requirements as presented in Section 2.1A of the Traffic Manual. All overhead signs in urban areas shall be illuminated. Overhead warning and regulatory signs in rural area shall be illuminated, as well as guide signs with “Exit Only” panels. Illuminate other overhead signs if:
 - ⇒ Sign visibility is less than 800 feet
 - ⇒ Outside light sources would interfere with sign visibility
 - ⇒ Sign has flashing beacon.

Consider the distance from the sign location to the power source. In remote areas where this distance is more than one-half mile away, consider not illuminating the sign.

III. SIGN DESIGN

Once the appropriate signs have been selected, they must be designed. The Sign Fabrication Manual contains the designs for commonly used signs and is used by the sign manufacturer. Since the Sign Fabrication Manual is used in conjunction with the signing plans it eliminates the need to include details for standard signs on the plans. Each sign in the Sign Fabrication Manual contains a sign number which begins with the series letter. Signs are divided into the following series:

D-Series:	Guide Signs (Conventional)
E-Series:	Guide Signs (Expressways and Freeways)
G-Series:	Informational (Construction, Maintenance and Traffic Survey)
I-Series:	General Information
L-Series:	Logos (Specific Service Signs)
M-Series:	Route Markers
P-Series:	Project
R-Series:	Regulatory
S-Series:	School (Warning and Regulatory)
W-Series:	Warning (Warning)
W-Series:	Warning (Construction)

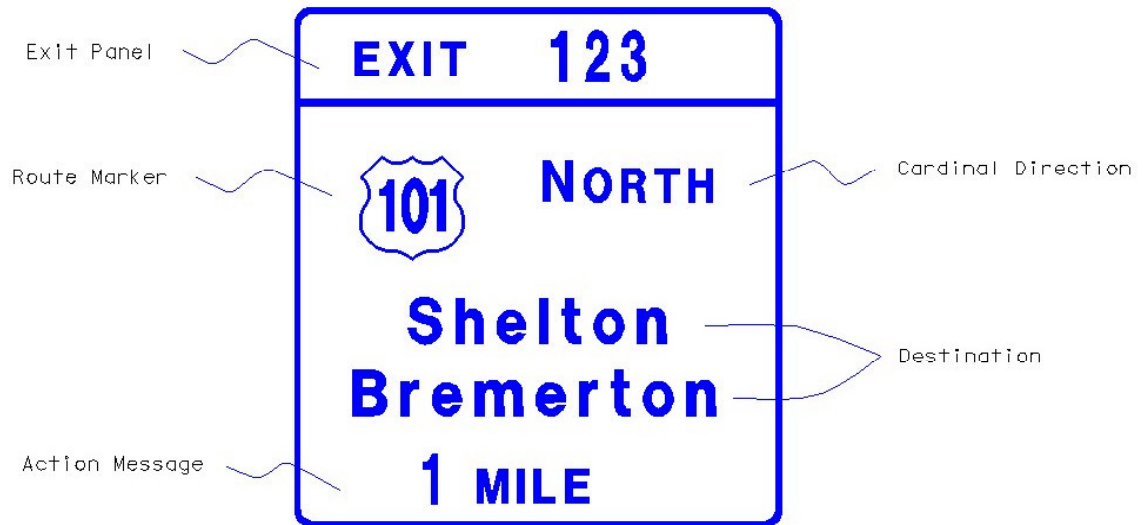
The Sign Fabrication Manual contains the details necessary to manufacture each sign. See Figure V.1, on page 61. There are generally different sizes that can be selected for each sign, which is based on roadway type and speed (see Section B of this chapter, “Legend Layout and Sign Sizing”). When the sign legend is fixed, only the overall size needs to be determined, most regulatory and warning signs fall into this category. However, if the legend is not fixed, which is the case for most guide signs, the appropriate legend, layout, letter sizing and spacing, and overall size may need to be determined. The amount of layout, spacing and sizing required, depends on the amount of variable components for each type of sign. Any component of a sign that is variable will need to be illustrated in a sign detail, and included in the plans for use by the manufacturer.

If a sign contained in the Sign Fabrication Manual needs to be modified for the project, use the same sign number followed by “MOD” and show the modifications on a sign detail in the plans. If a sign is needed that is not contained in the manual, it is given the sign number “SPECIAL”, and designed according to the appendices of the Sign Fabrication Manual and Section B “Legend Layout and Sign Sizing” of this chapter. All components of SPECIAL signs will need to be included as a detail in the plans.

Regardless of the type or size of sign, the type of reflective sheeting will also need to be determined.

A. SIGN LEGEND

The sign legend conveys the intent of the sign and may consist of word messages, symbols, and numbers.



Sign legends shall be as short and concise as possible. Guide signs are limited to two destinations and directional copy not exceeding three lines, which may include symbols, route numbers, arrows, cardinal direction, and the action message. When two or more guide signs are installed on the same support, there shall be no more than three total destinations displayed.

A1. Word Messages

Word messages may consist of destinations, cardinal directions, or phrases. All word messages shall appear in capitals, such as “RIGHT LANE MUST EXIT”, except for destinations (names of places, streets and highways) when the letter size is 8” or larger, which appear in upper and lower case, such as “Shelton”. The Sign Fabrication Manual indicates when to use capitals (caps) or upper and lower case.

When a cardinal direction is used the first letter shall be larger than the remaining letters in the cardinal direction. A 12” cardinal direct word will have a 15” first letter. A 10” cardinal word will have a 12” first letter, an 8” cardinal word will have a 10” first letter, a 6” cardinal word will have an 8” first letter, and a 4” cardinal word will have a 5” first letter.

Lettering is available in a variety of styles and sizes, see Appendix D of the Sign Fabrication Manual.

ENGLISH

Caps	4"
	5"
	6"
	8"
	10"
	12"
	15"
	18"
Upper/Lower	6" / 4.5"
	8" / 6"
	10.67" / 8"
	13.3" / 10"
	16" / 12"

Letter styles for standard signs are indicated in the Sign Fabrication Manual, while the letter sizes for guide signs must be selected. The letter size selected will govern the sizes of the other signing elements, such as numerals, symbols, etc. The MUTCD contains tables for letter and numeral sizing for guide signs on expressways and freeways: Use Table II-2 "Letter and Numeral Sizes for Freeway Guide Signs" starting on page 2F-5 for sizing of standard signs. This table is divided by interchange classification (Major, Intermediate and Minor) and overhead installations. Classification types are defined in Section 2E-23 of the MUTCD; category "a" of major interchanges is NOT used by the WSDOT.

Once the letter and numeral sizes have been selected from the MUTCD, verify that these sizes are available for that sign in the Sign Fabrication Manual. Use engineering judgment to choose the appropriate size from the Sign Fabrication Manual. If the MUTCD table does not apply for a special sign, use the letter height calculation presented in Chapter I of this manual, (Section G-2B, "Identification").

A1.A PHRASE SELECTION

Phrases shall be as concise as possible, and made up of words that are short and readily understood. Phrase selection is only necessary when designing new (SPECIAL) signs such as informational or special warning signs. Avoid using jargon or trendy words, as they may not be readily understandable to the traveling public.

A1.B DESTINATIONS

The selection of destinations is important to the quality of service provided by the highway. Hence, the American Association of State Highway and Transportation Officials (AASHTO) and the WSDOT have established “control cities” to be used on guide signs in the following situations:

- Interchanges between freeways,
- At connection/separation points of overlapping freeways,
- On intersection routes to guide traffic entering the freeway,
- On pull-through signs, and
- On the bottom line of distance signs.

Control cities and criteria for use can be found in Section 2.6-C1 of the Traffic Manual and Section 2F-7 of the MUTCD.

If the use of a control city or terminal destination is not required or if space is available for a second destination, choose the primary destination from the following:

- City or town located at or near interchange,
- Major highway junction if located prior to the city or town,
- Name of crossroad or street,
- A second major city or town,
- Mountain passes on primary highways,
- National parks,
- Seattle-Tacoma or Spokane International Airports.

Destinations are shown on guide signs in a near / far relationship. The first major destination encountered on the route is placed on the sign in the upper message (near) and the control city or the terminal destination is placed on the sign as the bottom message (far). When the major destination has been passed, the next major destination is placed in the near position. The MUTCD requires that destinations shown on advance guide signs shall be the same as on the exit directional sign. Advanced signing for intersections with different street names on each side- the top message will be for the left side street and the bottom message will indicate the right side street.

A1.C ABBREVIATIONS

Only abbreviate words to avoid excessively long messages. Words such as Street (ST), Road (RD) and Northwest (NW) may be abbreviated if necessary, as these abbreviations are familiar to the traveling public. A list of approved abbreviations is contained in Chapter 2 of the Traffic Manual. However do not abbreviate place names when used on guide signs such as “Pt Angeles” for “Port Angeles”. Note that periods are not needed for sign abbreviations, except for British Columbia (B.C.) and United States (U.S.) Customs. Requests for new abbreviations must be approved by the Northwest Region Administrator.

A2. Symbols

Symbols, as discussed in this section, include route markers, arrows, and symbols used on regulatory and warning signs. Use approved symbols with signs when possible. Symbols are used frequently on regulatory and warning signs as they are quicker to identify than reading a message, and are recognizable to non-English reading motorists. Symbols used on warning and regulatory signs shall only be those approved by the Federal Highway Administration. Sizes for these symbols have been predetermined and are shown in the Sign Fabrication Manual.

Symbols on guide signs usually consist of route marker shields and arrows. The sizes of the shield and the arrow are based on the letter size chosen and number of lines of copy. Shields are dimensioned in Appendix A-7 of the Sign Fabrication Manual. A revised version of Appendix A-7 can be found in section B, “Sizing the Sign”, of this chapter. Arrows are dimensioned in Appendix B of the Sign Fabrication Manual. The “up”, “diagonal”, and “horizontal” arrow are all rotations of the same symbol, while the “down” arrow is a separate symbol.

The diamond symbol is used with HOV (high occupant vehicles) signs. It is not used with bike lanes signs.

A3. Numbers

Numbers on a guide sign may consist of exit numbers or mileage. Exit numbers are only used on Interstate routes (see Section 2F-19 of the MUTCD for interchange numbering). The exit number is displayed on a separate panel at the top of the guide sign and are not to be incorporated into the sign legend. Exit numbers are displayed on the advance guide sign, the exit direction sign, and the gore sign. They may be used on supplemental guide signs and service signs to indicate the appropriate exit. Numbers for mileage are used on advance guide signs, distance signs and various supplemental signs. The Sign Fabrication Manual gives the dimensions and letter sizes for these signs.

B. LEGEND LAYOUT AND SPACING

B1. Standard Signs

For standard signs with no variable components that affect sign size, select the overall sign size directly from the Sign Fabrication Manual. The MUTCD states basic sign sizes to be used, though the Sign Fabrication Manual usually indicates a variety of sizes for each sign. The size of sign needed is based on the roadway type and speed. Generally warning signs for two lane conventional roads use 30-inch signs, for four lane conventional roads use 900mm (36inch) signs, and freeway/expressways use 1200mm (48 inch) signs. See Figure V.1. Use engineering judgment when selecting sign sizes.

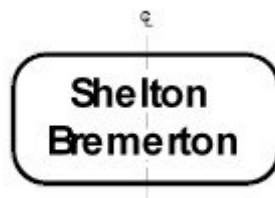
B2. Variable and Non-Standard Signs

When the overall sign size is not given or noted as “VAR” (variable) in the Sign Fabrication Manual, for standard signs, or when a special sign is being designed, the overall sign size is calculated based on the sign legend layout and spacing. Some standard signs such as the D1-101, have a standard height with a variable width. This width is dependent on the message length and must be calculated and included in the plans. See Figure V.2. Other standard signs may have a variable width and height, in which case both dimensions need to be determined. When designing a special sign, all dimensions and details must be given in order for proper fabrication. Appendix A of the Sign Fabrication Manual and the following sections give guidance for design of signing components.

B2.A *Sign Legend Layout*

Word Placement.

Messages are generally centered about the vertical axis of the sign background. The layout and placement of messages on advance and exit direction signs shall be similar.



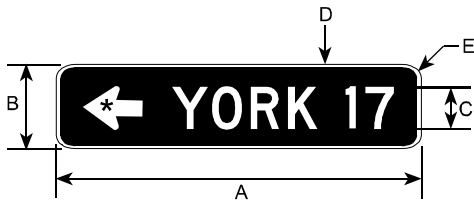
Exceptions include mileage and interchange sequence signs which have equal edge spacing left and right for all lines of copy regardless of message length.

Figure V.1 – Standard Sign (Freehand File “Standard Sign.FH8”)

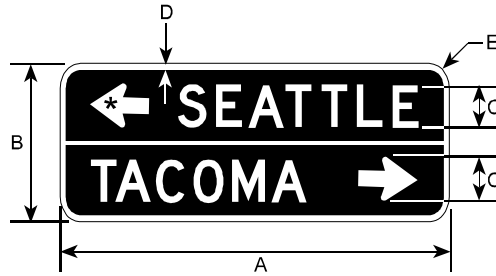
D1-101 & D1-201 & D1-301

10/97

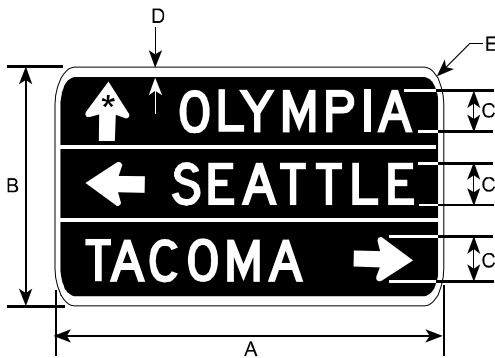
D1-101



D1-201



D1-301



* SEE APPENDIX FOR STANDARD DETAILS

SERIES D LETTERS ARE STANDARD.
SERIES C MAY BE USED AS A MINIMUM.

DELETE SEPARATION BORDER WHEN
DESTINATIONS ARE IN SAME DIRECTIONS.

DIMENSIONS (MILLIMETERS)						
SIGN CODE	MESSAGE LINES	A	B	C	D	E
D1-101	1	VAR	300	150D	19	38
D1-201	2	VAR	600	150D	19	38
D1-301	3	VAR	900	150D	19	38

DIMENSIONS (INCHES)						
SIGN CODE	MESSAGE LINES	A	B	C	D	E
D1-101	1	VAR	12	6D	3/4	1 1/2
D1-201	2	VAR	24	6D	3/4	1 1/2
D1-301	3	VAR	36	6D	3/4	1 1/2

COLORS

LEGEND — WHITE (REFL)
BACKGROUND — GREEN (REFL)

Figure V.2 – Variable Signs

Shelton	12
Bremerton	36

E7-1

The arrangement of messages depends on the type of sign. For mileage signs the correct order places the nearest destination at the top and the furthestmost destination at the bottom of the sign. When determining the distance on mileage signs use the corporate business district as destination. (the Traffic Manual will be updated to reflect this in the next addition) For destination signs on conventional roads, the through destination is at the top of the sign, the left destination is next and the right destination is at the bottom. See sign D1-301 on Figure V.2.

Route marker shields may be located either above or beside the destination. Words such as TO, JCT and cardinal directions may be placed either above or beside the route shields. The preferred placement is to the side unless there are two route markers on the sign.

When it is placed beside the shield, the top of the word shall be on the same horizontal level as the top of the shield. When placed above the shield, the word shall be centered over the shield. The words TO and JCT shall be located to the left of and centered on the shield while cardinal directions and BUSINESS shall be located to the right of the shield.



E1-1



E1-1



E1-1

Arrow Placement.

Arrow placement is critical since it implies the direction and, as a consequence, the navigational maneuver taken by the driver. The arrow placement angle should point approximately at the same angle as the ramp or turn departure, i.e., horizontal arrows for right angle connections.

- For exit directional signs the arrow points upward at an angle to approximately match the ramp alignment. The desired location of arrows on these signs is beside the destination. However, on ground mounted signs with long messages this location maybe too far from the roadway, in which case the preferred placement is below the message. In some cases, such as the sign E6-101 (see Sign Fabrication Manual), the arrow is placed where it best fits the sign layout.



E6-101
(Overhead Sign)

- For left turns the arrow points horizontally to the left and is located to the left of or below the destination. This is typically used on destination signs, route marker assemblies, etc. (See Sign Fabrication Manual signs D1-101 through D1-901 and M5-1 through M8-401.)
- For right turns the arrow points horizontally to the right and is located to the right of or below the destination. This is typically used on destination signs, route marker assemblies, etc. (See Sign Fabrication Manual signs D1-101 through D1-901 and M5-1 through M8-401.)
- For straight ahead on ground mounted signs the arrow points up and is located to the left of the cardinal direction.



M8-301

- For overhead signs, arrows pointing down are used to identify lane assignments (ie. for drop lanes, etc.) or to distinguish the through lanes at complex interchanges. These arrows should point to the center of the lane which is being assigned and can be tilted to emphasize the separation of roadways. They are located below the copy. There will be times when down arrow placement directly over the center of a lane is not readily achievable (e.g., a short legend, but with separate down arrows needed for each of two adjacent lanes). In such cases it becomes necessary to strike a balance between a sign that will be considerably wider than its legend would normally indicate, and the need for effective arrow placement over the lanes.



E6-2

Separation of Messages.

Separation of messages is accomplished by the use of horizontal border strips. Certain messages, when located without proper consideration, may be interpreted incorrectly by unfamiliar motorists. For example "Olympia" "State Capitol" when installed on two lines, "Olympia" on the first and "State Capitol" on the second, could be read as one destination "Olympia State Capitol" when it was intended to be two destinations. In this example, the proper layout would include a border strip between the two destinations. The length of this border strip should be approximately equal to the length of the shorter destination message.

Olympia State Capitol

Border strips can also be used to separate parts of a message for clarification.

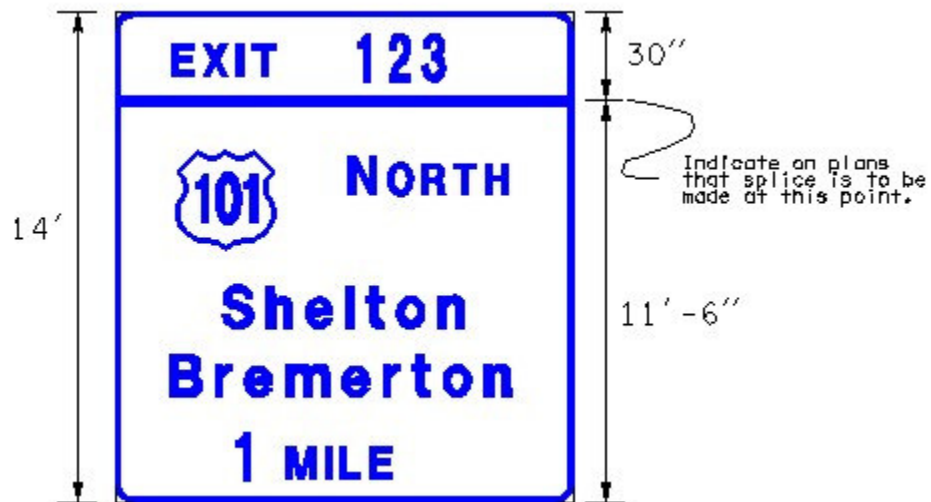


B2.B *Sizing the Sign*

After the sign layout has been completed, calculate the sign size. The following SPACING RULES for horizontal and vertical inter-line spacing conform to accepted practices. At this time there is no metric upper/lower case alphabet, therefore calculate these message lengths in English units and converted to metric using a constant of 25 mm to the inch.

Since legibility is dependent on letter size and spacing, the sign size should be based on the optimum spacing requirements. However, once the sign size is determined based on optimum spacing adjustments are then made to round the size to the nearest half foot, therefore legend spacing is not an exact science. While signs may be designed in metric, the aluminum is still only available in English units, therefore the sign must still be rounded to the nearest foot or half foot.

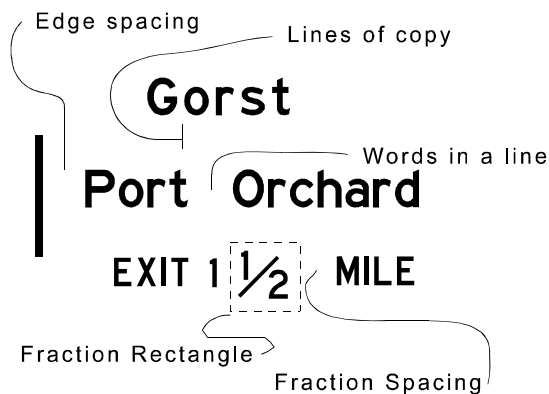
The maximum size aluminum sheeting is 4'-0" x 12'-0". When the sign height exceeds 12'-0" it will be necessary for the sign fabricator to utilize a horizontal splice. Try modifying the layout to reduce the sign height to 12'-0" to avoiding the horizontal splice when the sign is fabricated. If this is not possible, illustrate the splice location on the plan sheets. The desirable location of a splice is at the upper edge of a horizontal border strip separating two messages of the sign. Unless otherwise noted on the plans, the fabricator will use the longest panels in stock and shear additional panels to provide the necessary sign height. There may also be occasions on which vertical splice locations should be identified.



Spacing Rules.

Five general categories of spacing formula have been developed to ensure adequate legibility.

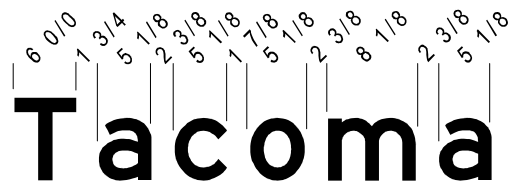
1. Between letters in a word.
2. Between words in a line.
3. Between lines of a copy.
4. Edge spacing.
5. Fractions.



Letters in a word.

Determine the longest horizontal message length as it will control the width of the sign. This is calculated by adding the letter width and the space between each letter in the word. The first letter width + the appropriate space + the next letter + the appropriate space . . . + last letter (which does not include a following space.) Appendix C of the Sign Fabrication Manual contains Letter width and spacing tables for the various series. Use Appendices C-3 through C-7 for

capitals (caps) and use Appendices C-9 through C-17 for upper/lower case. Note also the Message length programs that are available (See P. 75 of this manual).

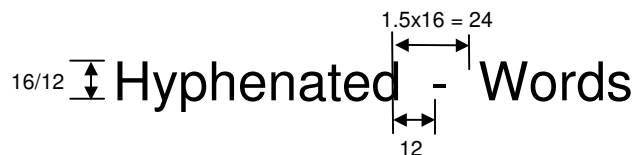


Words in a line

Optimum spacing between words in a line is equal to the height of the upper-case or capital letter in that line. The optimum spacing between symbols such as arrows, shields, etc. and adjacent words is equal to the capital letter height or 3/4 upper-case letter height in that line. The minimum shall not be less than 2/3 of the optimum.

The space between two letters used as initials, such as NW, should be equal to that letter height.

The space between two hyphenated words should be 1.5 times the maximum letter height of the two words. The hyphen, which is 0.4 times the maximum letter height, is centered between the words.



The space between letters of a destination such as "Coeur d'Alene" should be equal to the lower-case letter height with the apostrophe installed within that space.

Lines of copy.

The optimum vertical spacing between two lines of copy, whether destination names, shields or arrows is equal to the lower-case or 3/4 of the capital letter height of the sign message.

The minimum shall not be less than 2/3 of the optimum.

Edge spacing.

The distance between lines of copy and the edge of the sign is called the edge spacing. The optimum edge spacing is equal to the greatest letter height in that line.

The minimum shall not be less than 2/3 of the optimum.

Fractions.

Fractions are treated as a unit and not as separate characters. This unit is called the “fraction rectangle” which consists of the numerals and diagonal.

The diagonal length is 1.7 times the fraction numeral height; its width is equal to the stroke width of the numeral and is mounted at an angle of 60° from the horizontal.

The width of the fraction rectangle is 2.5 times the fraction numeral height except when the upper numeral is “1”, in which case its width is 2 times the numeral height. The height of the fraction rectangle is 1.5 times the fraction numeral height.

The spacing between a preceding or following letter and the fraction rectangle or a whole number should be equal to the fraction numeral height.

For guide sign action messages, the fraction numeral size is equal to the capital letter size in the adjacent action message. The height of a whole number in the action line is found in Table V.1.

Table V.1 – Action Message Numeral Height

<u>Letter Height (u.c./l.c.)</u>	<u>Whole Number Height</u>
16" / 12"	15"
13.33" / 10"	12"
10.67" / 8"	10"
8" / 6"	8"

For mileage signs, the numeral series and size shall be upper-case numerals of the same size used in the destination name. For interchange sequence signs the whole number size shall be the same as the upper-case letter size in the destination while the fraction numeral size shall be equal to the lower-case letter height. Numeral series on mileage and sequence signs shall be series E (modified).

Border Widths

Borders are required on all signs. The border gives the sign a finished appearance and makes it more conspicuous. The border width is dependent on the general sign type; whether a control or guide sign. Sign borders are approximately equal to the letter stroke width. The border falls within the edge spacing therefore, the border does not need to be included in the sign sizing calculation.

Margin Widths

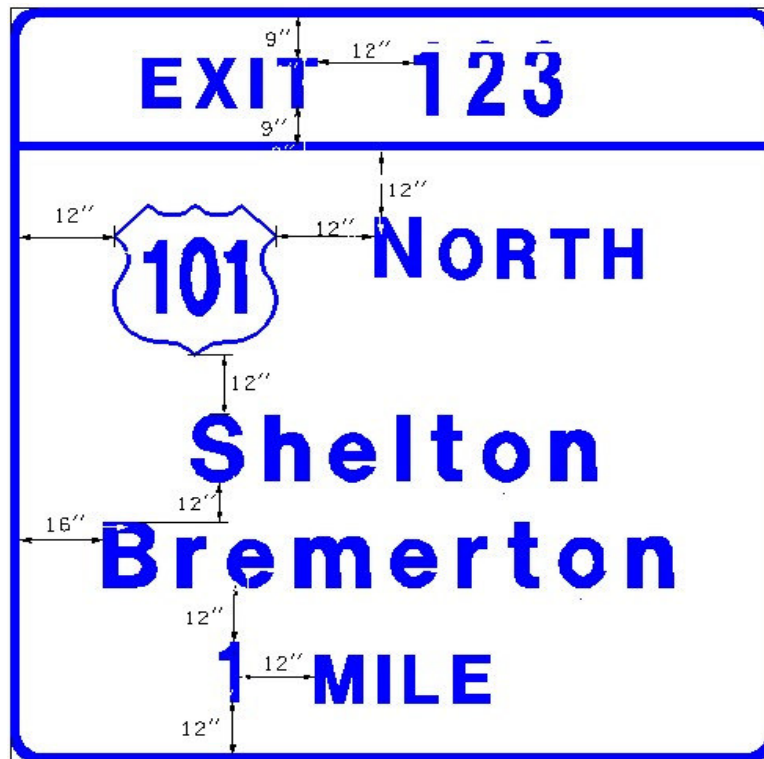
The use of margins between the border and the sign edge is also dependent on sign type. Margins are NOT used on guide signs or when the border is a lighter color than the sign background. Margin widths, when used, are approximately 3/4 of the border width.

Corner Radii

Since signs are often located in areas accessible to pedestrians it is mandatory to round all corners of the sign (except STOP signs) in order to prevent injury. Corner radii have been standardized according to sign size and are shown in Appendix A-3 of the Sign Fabrication Manual. Guide signs are normally installed above pedestrian traffic therefore rounded corners are not necessary. However, the "border" at each corner is always rounded for aesthetics and the radius is approximately equal to 1/8 of the sign height. The radius is then rounded to the nearest 3" with a maximum of 12".

Manual Sign Sizing Example

Determine, in English units, the overall size for the advance guide sign (E1-1) below:



For this example use a size code of E. From the Sign Fabrication Manual (sign E1-1), the following are the English dimensions for the various sign components:

Exit Panel			Route Marker	Card. Dir	Place Name	Action Message			Border Width
Word	Num.	Letter				Num.	Fract.	Word	
12E	18E	18E	36	15/12	16/12	15E	12E	12E	2

Horizontal Sizing

To determine the horizontal size of the sign, first determine which line will be the "controlling" line. The controlling line is the longest line on the sign. For this example it will probably be "Bremerton." Therefore, the length of this line is calculated first:

Using the above table, the size of the letters in the place name (for our example, "Shelton" and "Bremerton") will be 16/12. The width of the letters are found in Appendix C-9 for the upper case letter and Appendix C-10 for the lower case letters. The spacing between these letters (16/12) are found in Appendix C-15.

The following is the horizontal sizing for “Bremerton”:

Letter/Space	Inches	Appendix/Source
B	13	C9
space	5 ½	C15
r	8 ¼	C10
space	3 ⅛	C15
e	10 ¼	C10
space	5	C15
m	17 ¼	C10
space	4 ⅞	C15
e	10 ¼	C10
space	5	C15
r	8 ¼	C10
space	2 ¾	C15
t	7 ½	C10
space	3 ⅝	C15
o	10 ¾	C10
space	4 ⅞	C15
n	10 ⅞	C10
Width =	130	
Edge Space =	(16+16) = 32	See discussion under “Edge Spacing”
Total Width =	162” = 13’6”	

To verify that “Bremerton” is the controlling line, calculate the lines that appear to be the next longest. The horizontal sizing of the Route Marker (101 shield) and cardinal direction (NORTH) line can be found by using Appendix A-7 (a revised version of Appendix A-7 can be found on the next page):

The route marker shield is a M1-401 with 3 digits. From table J-3 using the M1-401, the cardinal direction NORTH and the size code E, the “W” dimension = 118”.

This W dimension includes the shield, cardinal direction and space between the two. Add the “s” values to this number to accommodate for edge spacing. Therefore the line size is: 118” + 2(12”) = 142”

APPENDIX A-7

5/98

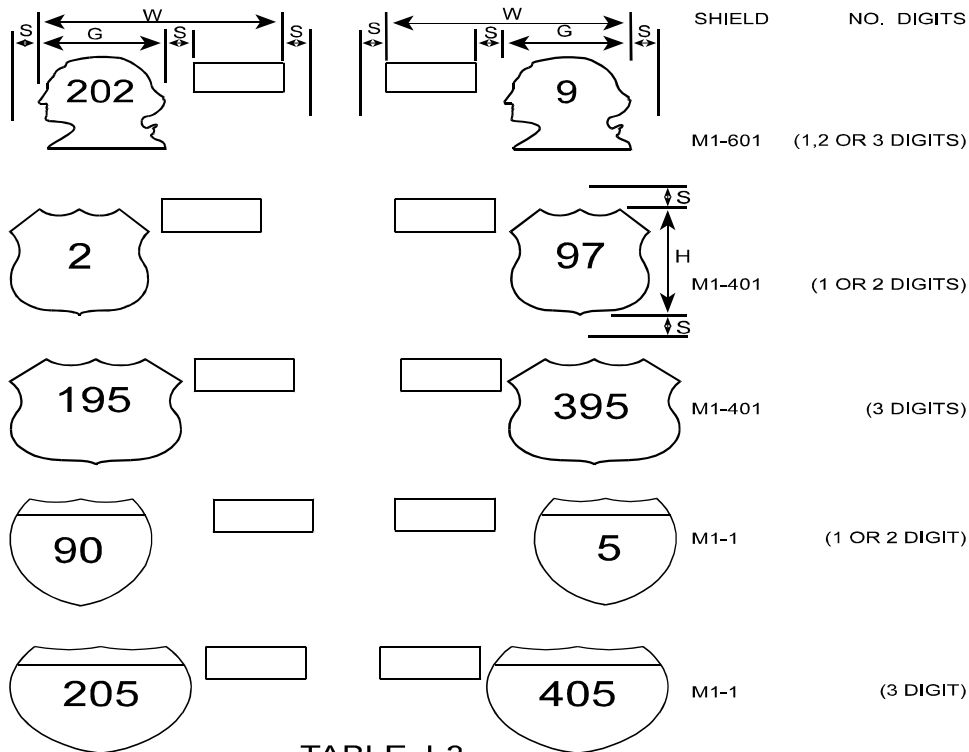


TABLE J-3

SHIELD CODE	SIZE CODE	SHIELD SIZE G X H	DIMENSIONS (MILLIMETERS) "W"						" S "
			NORTH	SOUTH	EAST	WEST	JCT	T	
M1-602	A	363 X 400	1300	1275	1075	115	975	800	150
	B	488 X 538	1725	1700	1450	1525	1300	1050	200
	C	725 X 800	2250	2225	1900	2000	1725	1425	250
	D OR E	725 X 800	2550	2525	2125	2250	1925	1575	300
M1-1 M1-401	A	450 X 450	1375	1350	115	1225	1050	875	150
	A	563 X 450	1500	1475	1275	1350	117	1000	150
	B	600 X 600	1825	1800	1550	1625	1400	115	200
	B	750 X 600	1975	1950	1700	1775	1550	1300	200
	C	900 X 900	2425	2400	2075	2175	1900	1600	250
	C	1125 X	2650	2625	2300	2400	2125	1825	250
	D OR E	900 X 900	2725	2700	2300	2425	2100	1750	300
	D OR E	1125 X	2950	2925	2525	2650	2325	1975	300

SHIELD CODE	SIZE CODE	SHIELD SIZE G X H	DIMENSIONS (INCHES) "W"						" S "
			NORTH	SOUTH	EAST	WEST	JCT	T	
M1-602	A	14 1/2 X 16	52	51	43	46	39	32	6
	B	19 1/2 X 21 1/2	69	68	58	61	52	42	8
	C	29 X 32	90	89	76	80	69	57	10
	D OR E	29 X 32	102	101	85	90	77	63	12
M1-1 M1-401	A	18 X 18	55	54	46	49	42	35	6
	A	22 1/2 X 18	60	59	51	54	47	40	6
	B	24 X 24	73	72	62	65	56	46	8
	B	30 X 24	79	78	68	71	62	52	8
	C	36 X 36	97	96	83	87	76	64	10
	C	45 X 36	106	105	92	96	85	73	10
	D OR E	36 X 36	109	108	92	97	84	70	12
	D OR E	45 X 36	118	117	101	106	93	79	12

The following is the horizontal sizing for "EXIT 123":

Letter/Space	Inches	Appendix/Source
E	8.81	C6: Table IV

space	2.48	C6: Table I then Table VI
X	10.31	C6: Table IV
space	2.48	C6: Table I then Table VI
I	2.06	C6: Table IV
space	2.48	C6: Table I then Table VI
T	8.81	C6: Table IV
space	12.00	See discussion under "Words in a line"
1	5.34	C6: Table V
space	4.64	C6: Table II then Table VI
2	14.34	C6: Table V
space	3.71	C6: Table II then Table VI
3	14.34	C6: Table V
Width =	91.8 = 92	
Edge Space =	(16+16) = 32	See discussion under "Edge Spacing"
Total Width =	124" = 10'4"	Round to 10'6"

Bremerton is the longest line at 13'6". Therefore this will be the overall width of the sign. The remainder of the lines will be centered on the sign by the manufacturer.

Vertical Spacing

The vertical size of the sign is based on line height and line spacing. Spacing revisions may be needed to adjust the sign to the nearest half foot or if the dimensions exceed the standard panel sizes. The vertical sizing is shown below:

Letter/Space	Inches	Appendix/Source
Edge Spacing	9	$\frac{3}{4}$ of capital letter height
"EXIT 123"	12	From the sign dimension table
Space	9	$\frac{3}{4}$ of capital letter height
Exit Panel Height	30"	Maximum allowable size is 30"
Space	12	Largest letter height in following line
(101 symbol) NORTH	36	From the sign dimension table
Space	12	Lower case height or $\frac{3}{4}$ capital letter
"Shelton"	16	From the sign dimension table
Space	12	Lower case height or $\frac{3}{4}$ capital letter
"Bremerton"	16	From the sign dimension table
Space	12	Lower case height or $\frac{3}{4}$ capital letter
"1 MILE"	12	From the sign dimension table
Edge Space	12	Largest letter height in previous line
Sign Height	140" = 11'8"	Round to 11'6"
Exit Panel Height	30" = 2'6"	
Sign Height	170" = 14'2"	Round to 14'

Since this is a standard sign, only the overall sign size needs to be given in the plans. If this was a special sign not included in the Sign Fabrication Manual, spacing dimensions would need to be shown. The sign spacing would need to be adjusted by 2", to account for the rounding that was done. Use Engineering judgment when selecting the spacing to be reduced. For this sign, a few possibilities may be reducing the space between "NORTH" and the separation line for the exit panel, or the very bottom space between the action message "1 MILE" and the bottom of the sign, or reducing both by 1" each.

- Calculate upper and lower case dimension in English and convert to metric. Calculate remainder of sign in metric. When using this method, verify that overall sign dimensions are to the nearest half foot. See previous section “Manual Calculations”.

The size of this E1-1 sign is 14’ feet high, including a 30” exit panel, and 13’6” wide.

There are various computer programs to determine message length and/or sign sizes. They are all based on the Federal Highway Administration’s spacing charts, which are found in the Sign Fabrication Manual appendices. Some of these programs are:

- Sign V2 – which was developed by WSDOT to calculate message lengths by prompting the user for the message, letter series, sign type and letter size. The message length is then calculated in feet and inches (See Appendix D of this manual for instructions in the use of the Sign V2 program).
- The Oregon Department of Transportation (ODOT) spacing guide - which was developed by ODOT and has essentially the same features as Sign V2.
- Sign CADD – which is a commercial program that will design the entire sign, including sign dimensions, graphic placement, and proper spacing of words. It is a Windows-based program with a series of menus and toolbars to aid in the design. The end result is a graphic representation of the sign that can be placed directly into the plans.

C. SIGN MATERIALS

Signs are constructed in two parts, a substrate and a retro reflective material applied over the substrate. WSDOT Standard Specification 9-28.1 requires an aluminum substrate to be used for all highway signs, although a fiberglass reinforced plastic material is allowed for signs which measure 900 mm or less on one side and are to be installed on one post. The use of fiberglass is at the contractor's option. Aluminum is an ideal substrate material since the sign blanks can be recycled a number of times.

Reflective sheeting is constructed in layers. There is an adhesive layer used to adhere to the substrate, a color layer, either glass beads or micro prisms to reflect light directly back to the source and a top coat to protect the sheeting. Different sheeting types have different reflective values and uses. WSDOT Standard Specification 9-28.12 gives the minimum acceptable values for the different sheeting types. The traffic manual, Section 2.1B, lists the different sheeting types and their uses. That list is duplicated below.

Sign Type	Location	Type*
All red background signs (Stop Wrong Way Etc.)	All	III or IV
Regulatory Signs	Rural	II
	Urban	III or IV
Warning Signs	Rural	II
	Urban	III or IV
Route Markers (M Series Signs)	All	II
General Information (I series Signs)	All	II
Milepost Markers	All	II
Freeway/Highway Entrance Signs	All	III or IV
Guide Signs (Backgrounds)		
Ground Mounted	All	II
Overhead (Lighted)	All	I
Overhead (Not Lighted)	All	III or IV
Letters, Borders, Symbols	All	III or IV
Blue, Brown Background Signs	All	II

*Sheeting Types as designated in ASTM Specifications D 4956

These sheeting combinations have been determined to provide all age groups of drivers with the sign conspicuity needed in rural low light areas and in urban areas with a high level of complexity in area lighting and surroundings.

The State Highway Log indicates whether a state route section is rural or urban. Either a "R" or "U" is noted under the Classifications column with heading "ST, FC", which is the State Functional Classification Code. Verify the classification with the Regional Traffic Office, as some areas may be considered differently for signing purposes.

IV. SIGN INSTALLATION

This section discusses the determination of the precise sign location, the selection and sizing of posts, and the installation on overhead sign structures, bridges, and miscellaneous features.

A. PRECISE LOCATION

The sign locations were selected while creating the preliminary signing plan; see Chapter IV Section F “Preliminary Signing Plan Layout.” Now, the “precise” sign location for each sign needs to be determined, based on signing policies and safety requirements, so it can be included in the contract plans. At this point the sizes of all signs (including guide signs) should be known. Careful analysis of the clearance and other requirements listed below should reveal if the proposed signs will actually fit in the preliminary locations selected for them. If the analysis reveals some problems (e.g., inadequate right of way width), then sign re-sizing or choosing alternative sign locations may be necessary.

A1. Vertical and Lateral Clearance

Sign locations are denoted in terms of the roadway station, V and W . V is the vertical distance from the edge of traveled way (edge stripe) to the bottom of the sign. W is the lateral distance from the edge of traveled way (edge stripe) to the centerline of the nearest post. To facilitate installation, the dimension W is used as it tells the installer where to locate the post. See Figure VI.1.

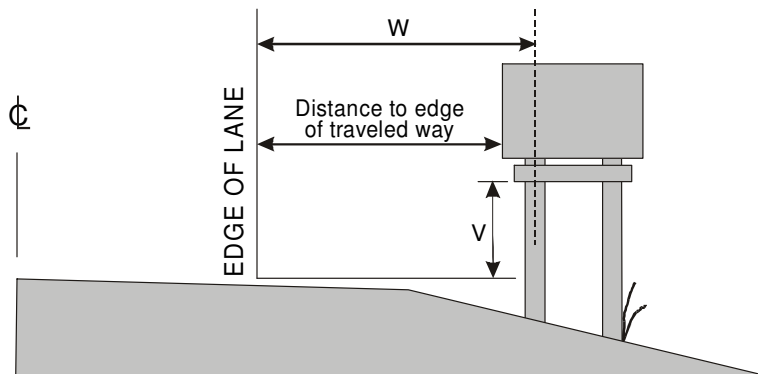


Figure VI.1 – Vertical and Lateral Clearance

1.A) VERTICAL CLEARANCE (V)

Use the Design Manual values for vertical clearance, as they are current WSDOT policy.

Milepost markers and lateral clearance markers are exceptions to these minimum vertical clearance requirements, as the small size of the markers and post do not create a hazard to errant vehicles. See Standard Plan G-7 for milepost marker mounting height and MUTCD Section 3C1.1 for lateral clearance marker mounting height.

The Design Manual gives both the minimum and maximum vertical clearances for overhead sign assemblies. These distances are measured from the roadway surface to the lowest point on the sign assembly (this will usually be a sign light assembly).

NOTE TO DESIGNERS:

Please note that on PS&E Signing Plans for Northwest Region the vertical clearances normally shown are the vertical dimensions from the roadway surface to the bottom of the signs (without reference to the sign light brackets). For most installations within Northwest Region this dimension will be 20'-0" (or 6.0 Meters).

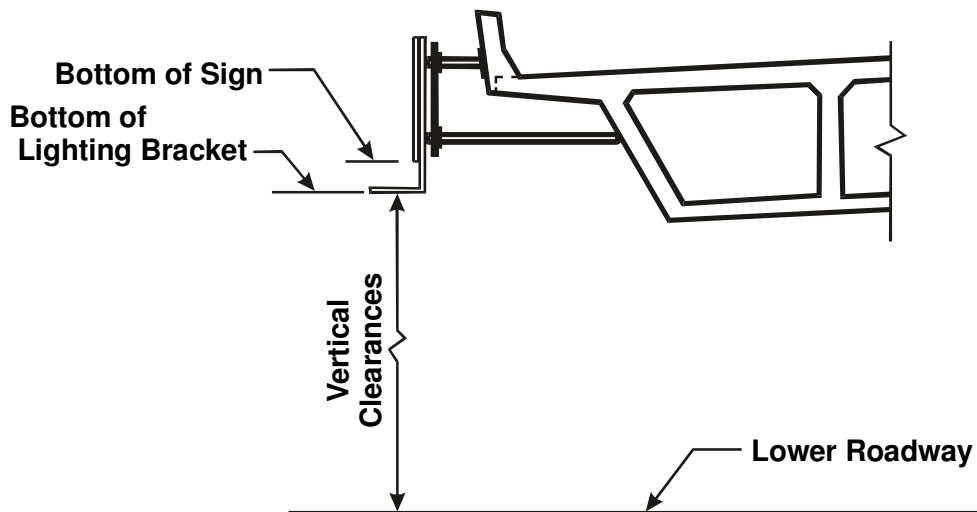


Figure VI.2 – Vertical Clearance

For ground mounted signs on cut slopes where the sign has more than one post, select post lengths that allow a vertical clearance of at least 2 ft from the ground to the nearest corner of the sign. This clearance is provided to ensure adequate sign visibility, even in the presence of substantial grass and other vegetative growth.

LATERAL CLEARANCE (W)

Lateral clearance requirements, found in the MUTCD Section 2A-24, state that the edge of the sign should be no closer than 6 feet from the edge of the shoulder, or if no shoulder, 12 feet from the edge of the roadway.

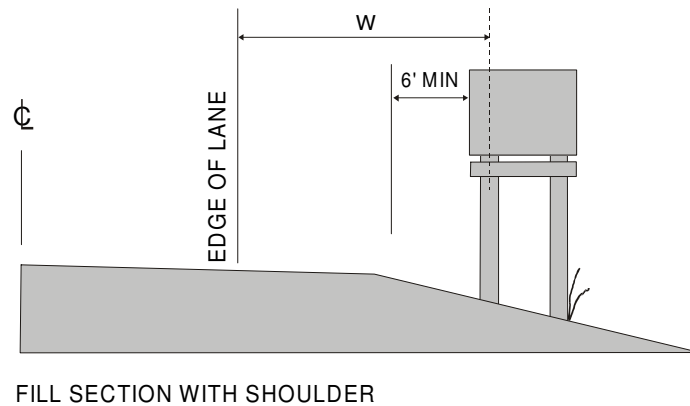


Figure VI.3

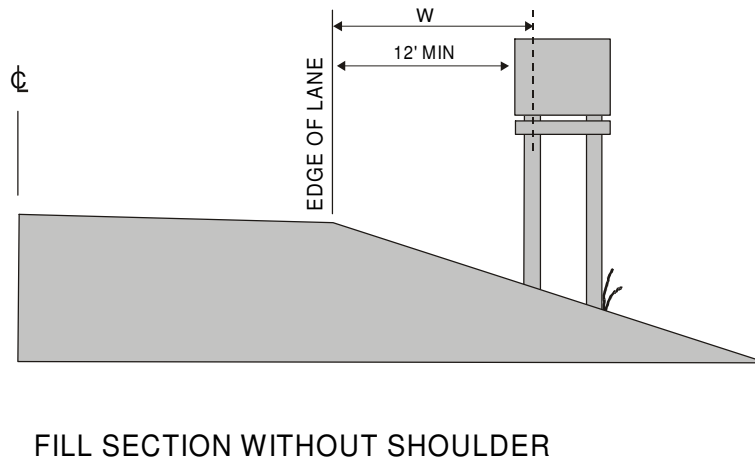
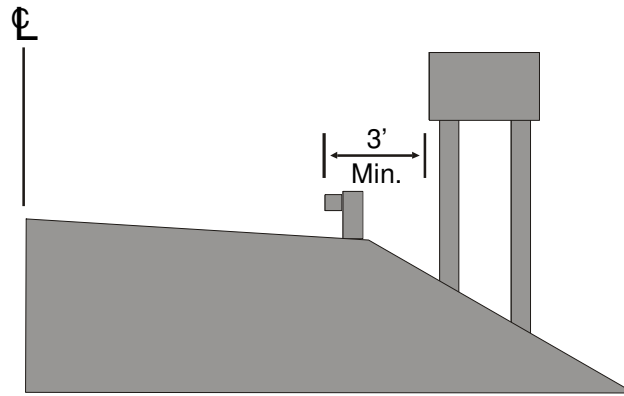
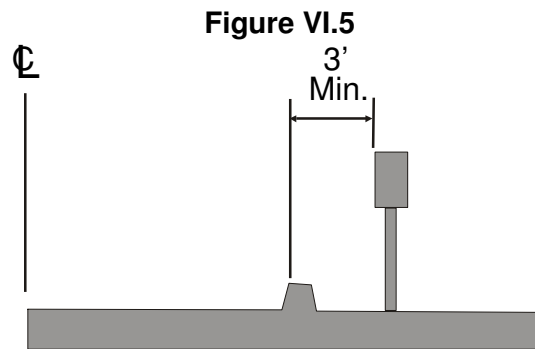


Figure VI.4

When behind a longitudinal barrier, the sign should be no closer than 3 feet from face of guardrail and in urban areas, the sign should be no closer than 3 feet from the face of curb.



Guardrail Section



Urban Areas

Figure VI.6

Even though these distances are given to the edge of the sign, when recording the lateral distance (W) in the contract plans, the dimension shall be from the centerline of the closest post.

Do not locate signs in the bottom of or straddling a ditch, as this would hinder ditch maintenance, could retard water flow, and could erode around the post or foundation. Locate signs at least 4 feet beyond the bottom of the ditch. See Figure VI.7.

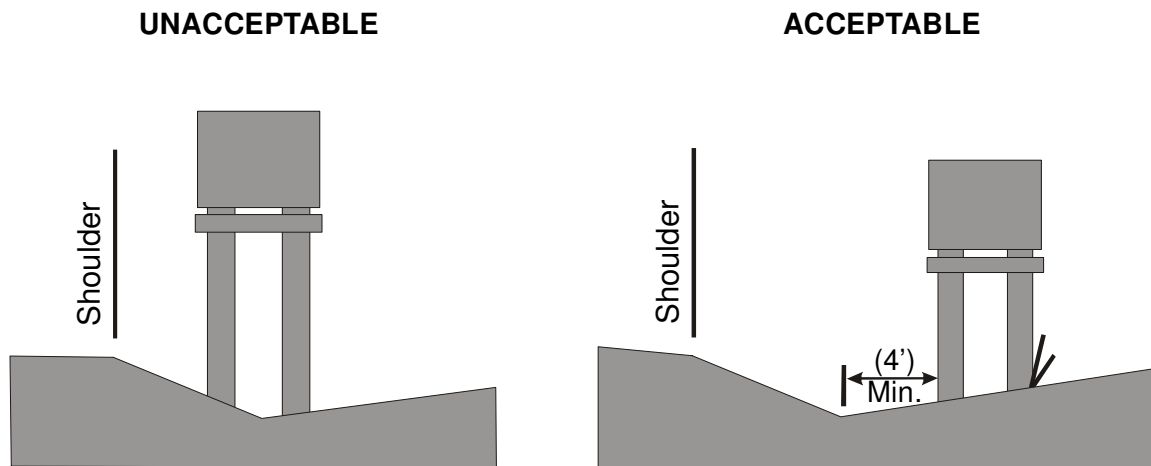


Figure VI.7 – Sign Placement

Regardless of the “minimum” lateral clearance, locate signs with the maximum lateral clearance practical without hindering visibility.

DESIGN CLEAR ZONE AND SAFETY FEATURES

The distance from the edge of a traveled way available for use by an errant vehicle is called the Clear Zone, see the Design Manual. Whenever possible, install all roadside features, including sign supports, outside of the Clear Zone for motorist safety and reduced maintenance costs. Refer to the Design Manual to determine the **Design** Clear Zone, section 700 (Roadside Safety)

Locate large guide and MIS signs outside the Design Clear Zone whenever possible. One possible method for installing signs outside the Design Clear Zone is to install them on overcrossing structures.

Wood Posts

Breakaway features for timber posts per Standard Plan G-4a consist of:

- Drilling holes parallel to the sign face in the post near ground level. This feature encourages the post to break when struck by a vehicle.
- Saw cutting a notch, when required, the width of the post, level with the bottom of the sign. This feature allows the sign to rotate over the vehicle, or the post to “swing” up and the vehicle to pass underneath.

Breakaway features for laminated wood box posts per standard plan G-4b consist of:

- Drilling two sets of 1 inch holes connected by saw cuts on both sides of the post.

When locating signs within the Design Clear Zone or in an area where it is likely to be hit, the following configurations are NOT allowed:

- Timber posts larger than 6x8
- Signs less than 12 feet wide on three timber 6x6 or larger posts
- Signs less than 17 feet wide on four timber 6x6 or larger posts

Consider using steel or laminated wood posts in these situations.

Steel Posts

Breakaway features for steel posts per Standard Plan G-8a consist of:

- Type 1 slip bases connecting the posts to the foundations, which encourage the post to breakaway from the foundation when struck. Slip bases are only designed for frontal strikes.
- Type 2a & 2b bases, which are equivalent to a slip base but are designed for multi-direction strikes. Type 2a & 2b bases are typically used at “T” intersections or ramp termini.
- Hinge plates located between the upper and lower posts, which breaks away when the sign is stuck. This hinge point acts similar to the notch in wood posts.

When locating signs within the Design Clear Zone or in an area where it is likely to be hit, the following configurations are not allowed:

- Combined steel post weight exceeding 45 lbs./ft. (67 kg/m) within a 7 feet wide path (steel post weights can be found in Figure 820-3 of the Design Manual). If steel posts are spaced at 7 feet or less, the combined weight is the addition of the linear weight of the two posts from the figure below. If the posts are spaced at greater than 7 feet, then the combined weight is that of the single post. See the example in section B “post mounting”.

<i>Beam Size</i>	<i>Weight (kg/m)</i>
W150x13	13
W150x18	18
W150x24	24
W200x27	27
W200x31	31
W250x33	33
W250x39	39

<i>Beam Size</i>	<i>Weight (lbs/ft)</i>
W6x9	9
W6x12	12
W6x16	16
W8x18	18
W8x21	21
W10x22	22
W10x26	26

If this condition is encountered, consider relocating the sign, resizing the posts, or protecting with longitudinal barrier.

B. POST MOUNTING

Ground mounted sign are installed on wood posts, laminated wood box posts, or steel posts. The size and number of posts is based on the mounting height and total surface area of the sign, as well as the sign width. These calculations to determine the correct post(s) size of each sign are found in the Design Manual; pages 820-5 to 820-9.

B1. Post Type

Northwest region policy is to use steel posts. Woods posts may be used on a case to case basis. Contact Northwest Region Sign Design.

Steel posts are used for:

- larger signs, as they are a sturdier support,
- permanent installations,
- in high wind areas,

When approved wood posts may be used:

- for temporary installations.
- Milepost markers, fire hydrant markers, lateral clearance markers (object markers)

B2. Number and Size of Posts

Once the post type has been initially selected, determine the number and size of posts for each sign by using the methodology in the Design Manual.

When calculating steel post sizes for MIS panels, calculate for the largest sign possible, even if the sign you are designing is smaller. This will allow for future expansion of the

sign, without having to replace the posts. For interchanges, the maximum number of business logos is six per panel. In the Northwest Region, business logos are arranged in two columns with three rows on a six-logo board. For conventional routes, the maximum of business logos per panel is four.

See preceding “Design Clear Zone and Safety Features” section for discussion on post size limitations within Design Clear Zones.

C. WIND LOAD

C1. Post Mounted Sign

See Design Manual Chapter 820 for signing guidelines and Figure 820-2,4 for details.

C2. Signal Mounted Sign

Street signs shall be 18” high with 8D size letters. For additional signal mounted signs comply with MUTCD current standards and Design Manual 820.04. Keep Electrical and Illumination groups informed of sizes of signal mounted signs.

D. MISCELLANEOUS MOUNTING

Situations may arise that require signs to be mounted in non typical locations, installed on supports other than wood posts, steel posts, or traditional sign structures, or installed with special hardware. Where possible install signs on light standards, signal poles or mast arms, or structure such as bridge columns. This will eliminate the need for the sign post. Reducing the potential of being hit by an errant vehicle.

When special mountings are required and are not detailed in the Standard Plans, the details must be included in the signing plans. Contact the WSDOT Bridge and Structures group for special mounting needs.

D1. Light Standards

When installing signs near light standards, they may be moved to the standard for installation. This will eliminate the need for any post. Signs mounted on light standards are limited to a maximum size of 20 sq. ft. A detail of the attachment hardware can be found in Standard Plan G-9b. Consult with the Signals Supervisor regarding the attachment of signs to light standards, as some regions prefer not to do this.

D2. Signal Poles

A signal mast arm may be a desirable location for the installation of street names signs, lane use control signs or signal display signs. A detail of this mounting hardware can be found in Standard Plan G-9b. The upright supports may also be used for sign installations. Ensure that signs on upright supports are mounted high enough to meet standards and to prevent conflicts with pedestrians. Consult with the Signals Supervisor regarding the attachment of signs to the upright supports of signal poles.

- All mast arm signs normally require a wind loading review by the OSC Bridge and Structures Division. Retrofitting existing mast arm sign heights greater than 18

inches or signs longer than 60 inches will require wind-loading reviews by the OSC Bridge Section. Wind loading reviews may take 30 to 180 days to complete depending upon the work backlog and the amount of review work involved.

- Wind loading request should be processed through the NWR Traffic Electrical Design Group via the NWR Traffic Operations Group. The data collection may take 15 to 30 days depending upon the work.
- Please note that a 2ft clear zone should be maintained around any signal head in order to allow easy access to the signal head. A six-inch clear zone should be maintained between the sign and the mast arm/pole connection.
- All mast arm street name sign messages should have the same message layout as any adjacent guide directional street name message layout.

An example of how to determine wind load when adding signs to signal mast arm.

You are presented with a situation in which you must add, change, relocate, etc., signing in regards to a signal mast arm (This does not apply to removing wind loading forces, only changing or adding):

Start - Check the Signal Operations signal files for the wind-loading chart and/or to get the contract number the signal under.

Step 1 – Check Right-of-Way for the contract the signal was installed. Keep in mind the signal could have been added by change order (should show up in Signal Operations files if that is the case).

Step 2 - After you have found the contract, look up the wind-loading chart for the signal and find the pole/mast arm you are dealing with. Check to see if the existing mast arm signs (if any) match the wind loading for the ones shown in the contract. That means you should already have a good idea of the size/location of the existing mast arm signs!!! If you cannot find the wind loading chart in the contract, consult with someone in the electrical design group to confirm. If that is still the case, go to step 6.

If you are adding a new sign, go to step 3

If you are increasing the size of an existing sign, go to step 4

If you are relocating an existing sign, go to step 5.

Step 3 – Add a new sign - Determine the square footage of your sign (xy) and multiply by the distance for the center of the sign to the center of the signal pole (z). If your xyz value is less than 10% of the given (design) wind loading value shown for the mast arm, proceed with the installation of the sign. If your value is greater than 10% of the mast arm xyz value, you must gather additional information to forward to Bridge for a final determination.

Step 4 – Increasing the size of an existing sign – Determine the wind loading of your sign as discussed in step 3. Subtract the wind loading of the existing sign (as shown in the contract) from the wind loading you calculated for your sign. Refer to the 10% discussion in step 3.

Step 5 – Relocating an existing sign – Determine the wind loading for the new location of the existing sign (as discussed in step 3). Subtract the wind loading value of the existing sign from the new value you calculated for your sign. Refer to the 10% discussion in step 3.

Step 6 – Cannot find the wind loading chart/contract – If the wind-loading chart cannot be found in the contract contact OSC Bridge with information about the signal pole/location. After providing them with the required information,(x, y, z-coordinates of your sign) they will determine if your sign can be installed.

Step 7 – If your xyz value is greater than 10% of the mast arm forward the signal information and the sign/mast arm location to OSC Bridge.

D3. Concrete Barriers

While mounting signs on concrete barrier is not an ideal situation, sometimes there is no other alternative. Since the width of most signs is larger than the width of the barrier, vehicles on the roadway shoulder can drive close enough to the barrier to strike the sign. Designers are encouraged to discuss barrier mount sign locations with Area Maintenance Offices to ascertain specific preferences that they may have.

The general requirements for installing signs on barriers are as follows:

- Signs are limited to 1.8 square meters 20 sq. ft. or less.
- Barrier must be at least 4 ft. from edge of traveled way. This is to allow for a shy distance from the edge of a diamond shaped 4' x 4' sign.
- Bottom edge to pavement should be at least 9.5 feet to allow street sweepers and snowplows clearance.

A detail of the mounting hardware can be found in Standard Plan G-9b.

D4. In Traffic Islands

When it is necessary to install signs in traffic islands use steel posts with breakaway features or wood posts with sleeves. Signs installed in traffic islands are susceptible to vehicle strikes and must be replaced often. When a wood post is installed in pavement without a sleeve, replacement is difficult because the post must be dug up generally at the expense of the surrounding asphalt or concrete. Steel posts with breakaway features and wood posts with sleeves allow post replacement without disturbing the surrounding area. A detail of the sleeve can be found in the Standard Plans.

D 5. On Structures

Some small signs, such as the street name signs (D3-301) or low clearance signs (W12-301 and W12-302) and street name signs attached to bridges will be 18" high sign with 8D text. Depending on the type and construction of the structure, the signs may be attached with a bolt and an insert drilled and bonded into the structure. In some cases, larger signs, no more than 4 ft. wide and 5 ft. high, can be attached to supporting columns or piers in the median of the roadway. Consult with the Bridge and Structures Office for recommendations and details.

D6. High Wind Areas

Geographic locations that experience recurring periods of high wind present a special problem for signs installed on single posts or light standards. Often, the attachments detailed in the standard plans are not adequate and special hardware must be included in the signing plans. Contact the sign maintenance forces in these areas regarding the best hardware devices to withstand the wind.

D7. Hardware

Sign mounting hardware, other than the attachments shown in the standard plans, is available from most commercial sign fabricators and suppliers. Catalogs are available describing the latest mounting devices. Remain in contact with these sources and be aware of new developments in the signing area.

E. OVERHEAD SIGN STRUCTURE

Overhead signs are typically installed on sign bridges, cantilever structures, or are attached to bridge structures. The number of required signs and the presence and location of bridge under crossings would determine the type of structure or attachment to be used. If a bridge under crossing is within a reasonable distance to a major guide sign location, mount the sign on the bridge structure. See the sign spreading discussion in Introduction I, SectionG-2b "Human Abilities - Perception".

A light standard shall never be closer than 50 ft to an overhead sign. See Plans Preparation Manual.

Keep the number of signs on a given overhead structure to a minimum. Per MUTCD Section 2E-8:

In no case should there be more than three signs displayed at any one location; including regulatory or warning signs either on the overhead structure or its support.

Guide signs located on the same support are limited to a total of three destinations per group.

Consider the number of lanes an overhead structure and sign will extend over. The lanes spanned by a structure must be closed during installation. And any lanes spanned by a sign must be closed during sign maintenance.

Do not attempt revisions to overhead supports without consulting with the Bridge and Structures Office.

E1. Sign Bridges and Cantilever Sign Structures

Sign bridges span all lanes of the roadway with a vertical support on either side, while cantilevered sign structures span only one or two lanes and have one support. There are two different types of sign bridge and cantilever structures: truss and monotube.

- The truss type is detailed in the Standard Plan G-2 for sign bridges and G-3 for cantilever sign structures. The accompanying sign attachment details are in Standard Plan G-9a. Windbeams and clips attach the signs to Z-bars which are attached by U-bolts to the truss framework.
- The monotube type is composed of single square tubes for both the support and span. W-beams attach the sign to the monotube structure. Contact the Bridge and Structures Office for design and details of monotube sign structures.

Within the Northwest Region, the selection of overhead sign structures (when they are warranted) is dictated by both policy and circumstances. Northwest Region policy is to install monotube structures only. They are more expensive than truss style structures initially, but studies have shown the overall life cycle cost to be lower and that they are more resistant to sign graffiti (i.e., they make sign access more difficult). Consistent use of structure types is desirable; particularly where more than one sign bridge or cantilever is visible.

There may be occasions where it is more prudent to install a truss style sign structure within the Northwest Region, such as a new truss structure on an existing foundation on a bridge or a local agency/public request to install a truss structure in a rural area. The Northwest Region Traffic Office shall approve installations of truss structures. Design Offices should verify the selection of sign structures with the Northwest Region Traffic Office early in the design process.

Regardless of the structure type, obtain cross-sections at the proposed structure locations from the project office for use in calculating the support heights. See Chapter VII "Signing PS&E" for structure detail sheets.

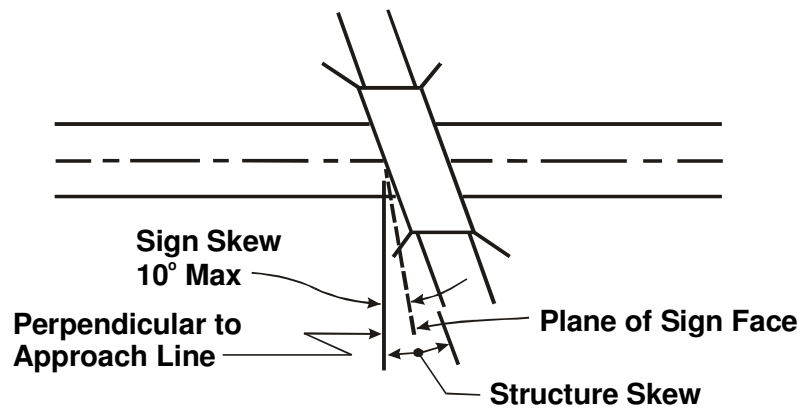
The design of the foundation for a sign bridge or cantilever sign structure is dependent on the soil bearing pressure. A designer must request a soil investigation of the location where these structures will be placed. For overhead sign supports (cantilever or sign bridges), the minimum lateral offset from the edge of the shoulder (or if no shoulder exists, from the edge of the pavement) to the near edge of the supports shall be 6 feet.

When removing an existing sign bridge, cantilever, or sign bridge mounted bracket record the SID number located on the structure to the plan sheet. The SID number is the number that is assigned to the structure in the SIGN BRIDGE REPAIR LIST and starts with SB?????. In most cases there is a tag on the sign structure in the field with the SID number on it.

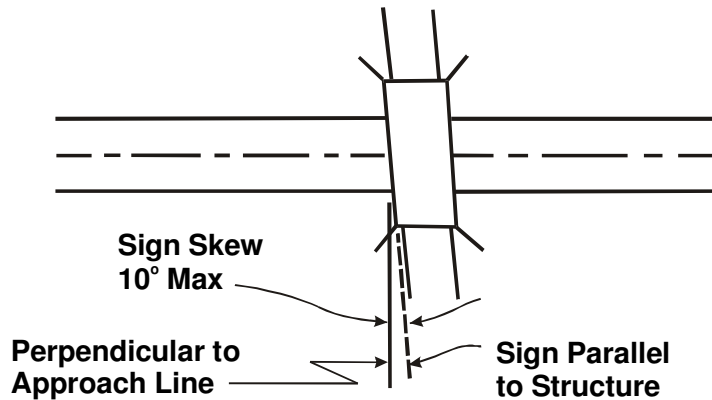
E2. Bridge Mounting

When attaching signs to bridge structures, detailed plans are needed to show the exact location and orientation over the lane. Orient bridge mounted signs at approximate right angles to approaching traffic. Signs *may* be slightly skewed but shall not exceed 10 degrees from perpendicular of the approaching lanes. For aesthetic reasons, the sign and its support should not extend above the bridge rail and the supports should be

hidden from view. See the Bridge Design Manual Section 8.2.2 for more information. Contact the Bridge and Structures Office for design of the mounting support.



Case A - Structure Skew Greater Than 10°



Case B - Structure Skew 10° or Less

Figure VI.8 - Skewness of Bridge Mounted Signs

E3. Sign Lighting

Section 2.1A of the Traffic Manual contains the criteria for lighting overhead signs based on the roadway classification: multilane highways or conventional highways. Note that in remote areas where the nearest power source is more than one-half mile away, the sign will not be illuminated because of the costs involved. Use type II sheeting for overhead lit signs.

Standard Plan G-9a contains the mounting details for sign lights.

Section 8-21.3(10)A of the Standard Specifications contain the criteria for sign light spacing:

The maximum horizontal spacing of sign lighting luminaire fixtures shall be 16 feet. End spacing of the outside fixtures to the edge of the signal shall be one-half of the spacing between adjacent fixtures. Spacing between adjacent fixtures shall be uniform.

If two or more closely spaced signs are in the same vertical plane on a structure, it shall be permissible to treat the signs as one unit in order to establish uniform fixture spacing and light levels.

Illuminated signs 16 feet or less in width shall have one fixture, and those wider than 16 feet shall have two or more fixtures in accordance with the above criteria or as shown in the Plans.

Sign Lighting Example

Design the lighting layout for a 24 ft. wide sign.

Solution:

Since the sign is more than 16 ft wide, use at least 2 lights. Check the assumption of two lights, using the following equation:

$$2S = X$$

Where:

S = Sign Light Spacing

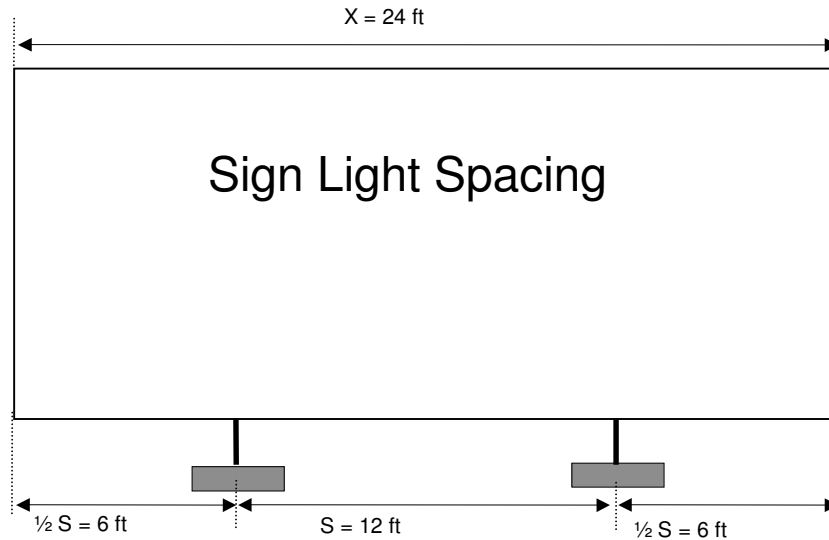
X = Sign Width

$$S = X/2 = 24 / 2 = (12 \text{ ft})$$

12 ft < 16 ft maximum fixture spacing. Therefore, two fixtures are needed.

(If the sign were 36 ft wide, $S = X/2 = 36 \text{ ft} / 2 = 18 \text{ ft}$ which exceeds the 16 ft maximum spacing, therefore this sign would require 3 lights; $S = X/3 = 36 \text{ ft} / 3 = 12 \text{ ft}$).

The calculated sign light spacing is shown below:



F. BANNERS

Any banner installed on a state owned signal pole or luminaire pole will normally require a wind loading review.

- Banner installation approvals are required from WSDOT, if:
 - The banners are mounted to state structures within limited access areas.
 - The banners are mounted to state structures within non-limited access in unincorporated areas.
 - The banners are mounted to state owned structures (e.g. signal poles) within non-limited access in incorporated areas.
 - The banners are overhead banners that span the state highway.
- Banners are classified into three groups based upon time.

Special event banners	-	30 days or less
Semi-permanent banners	-	31 days to 1 year
Permanent banners	-	1 year or longer
- Special event banners -
 - Banners may be sponsored by a private group or a local agency.
 - This type of banner request should be submitted to the NWR Traffic CTCO Group.
 - The NWR Traffic CTCO Group will issue a "Special Event" approval letter that will include the banner approval.
 - (No "General Permit" is required for a special event banner.)

Subject to the banner size, the banner request may be forwarded to the NWR Traffic Operations Group for a wind loading review.

- Semi-permanent and permanent banners -
These banners should be sponsored by a local agency rather than a private group.
Local agency semi-permanent and permanent banner requests should be processed through the NWR TransAid Section.
The NWR TransAid Section will forward the requests to the NWR Traffic Operations Group for wind loading reviews.
A General Permit is required for this type of banner. A general permit application would be issued by the NWR Utilities Group.
- Luminaire mounted banners –
Banners 30 SF or under will not require any wind loading reviews, unless a sign is also attached to the pole.
A review will be required, if the combined area of both the sign and the banner is more than 20 SF.
When banners have a total area in excess of 20 SF, the banners need to have wind slits.
(Check with the sign fabricator for usual practice on the number and placement of wind slits.)
Banner mounting (bracket attachment) should be in accordance with the manufacturer's recommendation.
- Signal pole mounted banners -
Banner criteria is the same as that listed for luminaire mounted banners. However, a more in-depth review is required for signal pole mounted banners to make sure that the overall wind loading safety factor is not exceeded. Other items that must be considered in the signal pole reviews are the signal mast arm location and length, the signal head locations, the location of any mast arm signing, etc.
- Shoulder mounted banners - the bottom of the banners should be mounted 10 feet above the roadway.
- Overhead banners - the bottom of the banners should not be less than 20 feet above the roadway.
- Wind loading reviews -
The NWR Traffic Operations Group does not do the actual wind loading calculations.
Staff personnel gather any necessary data and submits the data to the OSC Bridge and Structures Division.

The OSC Bridge and Structures Division reviews –

Review time may vary depending upon the banner locations, signal mast arm and other pole mounted sign locations. At present, the current review turnaround time is approximately one week for luminaire pole reviews, but may exceed 60 days for signal pole reviews depending upon the amount of hardware attached to the signal pole.

- Information normally needed for the wind calculation reviews is:
 - Banner size (with or without slits)
 - Banner/pole attachment drawing (manufacture's catalog cut)
 - WSDOT pre-approved or approved signal/luminaire poles specification data - name of the pole manufacturer, the pole height, pole size, signal/luminaire arms (length and number, indicate if a single or double arm), pole material (aluminum or steel)

V. SIGNING PS&E

When work is not done by State forces, there must be a written agreement between WSDOT and the Contractor. The written agreement (contract) describes:

- What work will be done,
- When it will be completed,
- Who provides the labor and materials, and
- How the Contractor will be paid.

The documents that make up the contract are shown below. If a conflict exists between any of the contract documents, the order of precedence is as shown below (e.g. 3 “special Provisions” has precedence over 4 “contract plans”).

1. Addenda - written or graphic documents which modify or supplement the contract documents. These are issued prior to the bid opening.
2. Proposal Form - a list of all construction items, or “bid items” for the project. This list includes the item numbers, estimate quantities, item descriptions and a blank space for the Contractor’s bid.
3. Special Provisions - project specification which supplement the Standard Specifications.
4. Contract Plans - plans illustrating locations, character and dimensions the prescribed work.
5. Amendments to the Standard Specifications - modifications or supplements to the Standard Specifications.
6. Standard Specifications - standard provisions and requirements used for all work for WSDOT. These are published by WSDOT and the American Public Works Association in a book called “Standard Specifications for Road, Bridge, and Municipal Construction”. Sections 8-21 relates to sign construction and section 9-28 relates to sign materials.
7. Standard Plans - a manual of standardized plans or drawings used by WSDOT for frequently reoccurring items of work.

The designers are only responsible for the special provisions and the contract plans pertaining to their items of the design. The contractor uses these and the remainder of the contract documents to bid on and construct the project, therefore they must be clear and concise to avoid any misinterpretation. Unclear items of work will usually receive a higher bid price, therefore for WSDOT to receive the best possible bid and the best possible finished product, every item of work must be clearly identified and described. Standardization of the contract components help the contractors to easily recognize standard materials and items of work. This is important as standard elements usually cost less.

Along with the special provision and contract plans, the designer is also responsible for preparing a construction estimate. This will be used to help determine competence of the contractors’ bids and may be used by the field office during construction.

The plans, specifications (special provision) and estimate are commonly referred to as “PS&E”. Utilize the guidance provided in the Plans Preparation Manual for preparing complete and standardized PS&E for all WSDOT projects.

A. PLANS

WSDOT Plans Preparation Manual Division 4 “Contract Plans” provide guidance for standardizing the plans while maintaining flexibility for depicting nonstandard work items or standard work in nonstandard situations. Sections 460.22 “Sign Specification Sheet”, 460.23 “Signing Plan” and 460.24 “Signing Details”, give information regarding each type of signing plan sheet.

The signing plans are normally part of a larger PS&E package, therefore it is important to coordinate the plan appearance and development with the project office.

A1. Signing Basemaps and Sheet Files

There is a preferred procedure for preparation of Northwest Region Signing Base Maps and Sheet Files. Please refer to the Northwest Region policy outlined in the Northwest CAE Notice dated 10/14/99 (see Appendix C, Letters and Memos). Following this procedure will ensure that the plan preparation process gets off to the correct start.

A2. Plan Appearance

Discuss with the project office the method being used to represent the project work. If stationing is being used for the remainder of the work, use stationing for the signing plans. If mileposts are being used for the work, use mileposts for the signing plans. This will provide continuity and consistency throughout the contract plans, making the plans easier to follow.

If the quantity of signs is extensive, based from the preliminary signing plans, prepare a series of plan sheets solely for signing. See Example 4-27 of the Plans Preparation Manual. However, if the signing is not extensive, combine the signing with another series of plans, as long as the scale of the plans is large enough to show the work clearly. The paving plans or the channelization plans are often good places to show signing. These are normally drawn to a scale of 1:500 (1:50 English scale) and have sufficient room outside of the shoulders to show the sign locations and details.

NOTE TO DESIGNERS:

The permanent signing plans should be completely separate from traffic control or construction signing plans. Do not show or combine temporary signing with permanent signing on any of the plan, detail, or sign specification sheets.

When preparing separate signing plans, decide how much detail is required to adequately show the signing. Often, a strip map showing only the construction center line is sufficient for the signing layout. It may also not be necessary to show the entire project if only a few signs are spread over a distance. Use break lines to avoid showing sections of the project that do not contain signs. See Example 4-22 and 4-28 of the Plans Preparation Manual.

Combining strip maps and more detailed drawings is also acceptable. Areas, such as intersections, that require extensive signing must be shown at a scale to clearly represent the sign placement. To do this use strip maps for the majority of the project; change scale to show the detail; then revert back to the strip map. As an alternative, use a strip map with circles around areas requiring more detail and a note if necessary to indicate where to find the signing details. The goal is to provide the required information with sufficient detail to achieve the desired results.

NOTE TO DESIGNERS:

The selection of appropriate plan scale is essential to allow effective understanding by plan readers. Permanent Signing PS&E submitted to the Northwest Region Traffic Office for review may be returned to the design office for re-working if the plan scale for permanent signing is inadequate.

Regardless of the type of signing plan being prepared, adhere to Section 460.23 of the Plans Preparation Manual.

Coordinate the construction surveying responsibility with the project office. Either the Contractor or the construction office will be responsible for the surveying. If the construction office does the surveying, they will make adjustments based on actual field conditions to optimize the sign location. This field engineering takes a good signing plan and turns it into a good signing project. Even though, the designer can satisfy all the rules, the “best” location for many signs cannot be determined until the field conditions actually exist.

If the Contractor is responsible for surveying the sign locations, take extra care, and possibly conduct additional field reviews, to ensure that the signs are located at the optimal location. The Contractor does not include field engineering of sign placements in their bid, therefore, will install the sign at the location shown on the plans, regardless of whether it is the optimum location. Consider writing a project specific provision to provide one of the following:

- Require the Contractor to stake the sign locations, and have each location approved or adjusted by the construction office prior to the sign installation.

or

- Relieve the Contractor of the responsibility of staking the sign locations and assign the responsibility to the construction office.

A3. Plan Development

This section supplements the information provided in Section 460.22 through 460.24 of the Plans Preparation Manual.

The signing plans are made up of some, or all, of the below sheets. The order of the signing sheets is given in Section 460.01 of the Plans Preparation Manual and is as shown below.

- Sign Specification Sheets
- Signing Plans
- Signing Details-(these may be included on the plan sheets if space is available).

A3.A *SIGN SPECIFICATION SHEETS*

The sign specification sheets contain all necessary fabrication, installation, relocation and removal information for each sign. For general guidance, see Section 460.22 of the Plans Preparation Manual. However, NW Region Sign Designers should follow the specific example shown in this Current Practices document (see Appendix D). New Installations, relocations and removals are all shown on one set of specification sheets, with entries made in the manner shown on the example sheet.

Each number is used only once and work at any one location is always shown with consecutive numbering so that it appears in the same general area of the sign specification sheet. If a sign note is eliminated during the design process, simply remove all of the information for this sign from the sign specification sheet, except the sign number, and then put the note "NOT USED" in the station column.

Sign specification sheets must contain the information noted below.

Sign specification sheet entries for new installations are outlined below:

- Sign Numbers – Sign numbers correspond to the numbers on the plans. See examples provided.
- Sign Codes – obtained from the "Sign Fabrication Manual".
- Description - an abbreviated sign message to assist the Contractor and field personnel not familiar with the sign codes. This is not always shown on the specification sheet, or may be included with the sign code.
- Location - given in station or milepost with a right or left indicator.(RT, LT)
- Sign Size - based on the highway type as shown in the "Sign Fabrication Manual" and as discussed in Chapter V, "Sign Design".
- Sheet Type – type I, II, III, or IV. See Chapter V, "Sign Design".
- Letter Size or Code - as identified in the "Sign Fabrication Manual", or if no code, is identified as "standard".

- Post Material - timber (wood), steel, or laminated wood. See Chapter VI, "Sign Installation".
- Post Size – based on the sign size. See Chapter VI, "Sign Installation".
- Post Length – based on mounting height, sign height, side slopes, and embedment depth (see Chapter VI "Sign Installation" and Standard Plans G-4a, G-4b, G-8, and G-8a). Note this is not "Z".
- Clearance (V and W) – vertical and lateral clearance from the edge of traveled way. See Chapter VI, "Sign Installation".
- Remarks - any special notes to the sign installer, such as "mount below sign no. 7". Used to clarify any potentially confusing installation instructions. Identify the base type (1, 2A, or 2B) to use for installation with multiple steel posts (see 1/6/99 memo from Jim Shanafelt in Appendix C). See Standard Plans G-8.
- Notes - standard notes that are always included at the bottom of the sign specifications sheet. Additional project specific notes may also be added. Include note "Steel Sign Posts are AASHTO M 183" (see 8/5/96 memo from Fred Sommer/Rick Mowlds in Appendix C.)

Sign specification sheet entries for relocations are outlined below:

- Sign Numbers – Sign numbers correspond to the numbers shown on the plans. See examples provided.
- Sign Codes and Description – codes are NOT needed, but an abbreviated sign message is required. This will ensure that the proper sign is relocated.
- Location - in addition to the station of the new sign location also include the station of the existing location. The right or left indicator will also be needed if space permits.
- Sign Size – Sizes of existing signs may be used by the Contractor to determine the level of work required. If showing this information, show the existing sign sizes in the "Remarks" column only.
- Post Material – for the new location use timber (wood), steel, or laminated wood. See Chapter VI, "Sign Installation".
- Post Size – for the new location. Do not relocate existing wood posts, as they are likely to become damaged during the removal process.
- Post Length - for the new location. Based on mounting height, sign height, side slopes, and embedment depth (see Chapter VI, "Sign Installation", and Standard Plans G-4a, G-4b, G-8, and G-8a). Note, this is not "Z".
- Clearance (V and W) – vertical and lateral clearance from the edge of traveled way. See Chapter VI, "Sign Installation".

- Remarks - any special notes to the sign installer, such as “mount below sign no. 7”. Indicate if existing posts are to be removed, and the base type to be used for installations with multiple steel posts.
- Notes - standard notes that are always included at the bottom of the sign specifications sheet. Additional project specific notes may also be added. Include note “Steel Sign Posts are AASHTO M 183” (see 8/5/96 memo from Fred Sommer/Rick Mowlds in Appendix C.)

Sign specification sheet entries for removals are outlined below:

- Sign Numbers – Sign numbers correspond to the sign numbers shown on the plans. Note that there is an “R” in front of the sign note to indicate removal.
- Sign Codes and Description - codes are NOT needed, but an abbreviated sign message is required. This will ensure that the correct sign is removed.
- Location – given in station or milepost with a right or left indicator for the existing sign.
- Sign Size – used by the Contractor to determine the level of work required. The WSDOT Sign Shop also uses this information to track removed sign material.
- Post Material – used by the Contractor to determine the level of work required.
- Post Size – used by the Contractor to determine the level of work required.
- Remarks - any special notes to the sign remover. Used to describe what is being removed, such as “remove sign and post(s)”, “remove sign”, or “remove plaque”.
- Notes – standard notes that are always included at the bottom of the sign specifications sheet. Additional project specific notes may also be added.

A3.B SIGNING PLAN SHEETS

Section 440 and 450 of the Plans Preparation Manual contain guidelines for all plan sheets. See Section 460.23 for information specific to the signing plans. These references provide general guidance for the sign designer, however NW Region Sign Designers should follow the Signing Plan examples in this Current Practices document (see Appendix D).

Use the fewest number of plan sheets possible, drawn at an appropriate scale to adequately show the desired work. Discuss with the project office prior to starting work to determine the appropriate type of signing plans for the project. Tailor the signing plans to the amount of signing and the characteristics of the project. They do not always require a separate or complete series of signing plans. However, whether there are separate signing plans, or they are combined with another series of plans, the required signing information per section 460.23 is the same. All signing plans will show the following:

- 1) Construction center lines

- 2) Basic roadway layout in areas where detail is required.
- 3) Sign locations (all existing, plus new installations, relocations and removals).
- 4) Small-scale layout of directional and special signs (these should be on the same signing plan sheets where the sign notes appear, when space for this is available).
- 5) Small-scale layout of standard control signs may be shown, but is not required.
- 6) The plan sign number with leader pointing to sign location.
- 7) The WSDOT Sign code number adjacent to plan sign number (for new installations), or the abbreviated sign message (for relocations and removals).
- 8) North Arrow
- 9) Sign Legend
- 10) Abbreviation Legend if abbreviations are used.
- 11) Power source for all signs to be illuminated.
- 12) Abbreviation Legend for words within the project's specification sheets or plan sheets that are abbreviated and maybe unclear. (examples or STD, ILLUM,...)

For a separate signing plan series, obtain the CADD files from the project office. These files will contain plan view base mapping of the existing features and will include the new roadway design. Determine the appropriate amount of detail to be shown for the signing plans. Intersections may require more detail than straight sketches of roadway. Consider the recommendations from the previous section "Plans Appearance"

If strip maps are used, obtain the CADD files from the project office to develop the strip maps, or develop them from scratch. Strip maps provide a simple graphic representation of the project. Therefore, they do not require a lot of detail and may be drawn as a straight line even though the roadway has curves. The optimum sign locations for these projects are usually determined in the field after construction, based on the actual field conditions.

If the signing plans are combined with another series of plans, the project office will provide the required CADD files when they are completed. However, proceed with work prior to getting the final CADD files by using the preliminary CADD files. Place the signing information on a separate CADD level. When the completed CADD files are received from the project office, the signs can be easily imported to the new files.

CADD levels and standard symbols are in Division 5 "Contract Plan Standard Symbols & Conventions" of the Plans Preparation Manual. The index for signing elements is located on page 5-7. A ground mounted sign is depicted by the appropriate number of posts, represented by circles, and the sign, represented by a straight line. The sign is drawn on the side of the post to face the traffic. New signs are shown with solid circles, while existing signs are shown with hollow circles.

New Sign



Existing Sign



Modify the symbols in the Plans Preparation Manual when needed to illustrate different situations such as overhead or miscellaneous installations. Also show the lateral barrier placements for protection of the signs on the signing plans. This information will aid the Contractor in making a responsive bid.

A3.C *DETAIL SHEETS*

Show the sign layout details on either the associated plan sheet or a detail sheet. These details illustrate variable sign components and nonstandard signs. They are intended to show the sign legend exactly as it should appear on each sign, including upper/lower case lettering, shields, arrows and symbols. They also give letter sizes, letter code, arrow types, spacing, or any other dimensions not included in the “Sign Fabrication Manual”. These details are used by the sign manufacturer to fabricate the signs. If using the sign layout graphics for standard signs to assist the Contractor and WSDOT field inspector, locate them on the plan sheets versus the detail sheet.

NOTE TO DESIGNERS:

Accurate and complete sign details are considered an essential part of the plan set; they allow both the project inspector and sign fabricator to fully understand the intention of the sign designer for guide signs, modified signs and special signs. Signing plans submitted to the NW Region Traffic Office that have incomplete or inadequately presented sign details may be returned to the design office for re-working.

Detail sheets are also required for any special mountings that are not shown in the Standard Plan. This includes any overhead sign installations and some miscellaneous mountings. While the general details for truss type cantilevers and sign bridges are given in Standard Plans G-2 and G-3, the specifics, such as posts lengths, sign location, etc. still need to be shown in the detail sheets.

When using overhead structures, obtain and complete the cantilever or sign bridge installation sheets (see Example 4-29 from the Plans Preparation Manual). These sheets can be obtained from the WSDOT Standard Symbols and Conventions library: CANTIS (cantilever structures) and SNBRIS (sign bridges). Complete the table with the appropriate information and provide a cross-section of the roadway at the sign structure location including:

- A drawing of the sign structure
- All dimensions necessary to show the relationship of the sign structure and signs to the roadway and lane configuration
- Sign light locations
- Maintenance walkway limits if applicable
- Other features like guardrail, concrete barrier, or sidewalks that could affect the placement of the sign structure. Include dimensions.

Contact the Bridge and Structures Office for details of bridge and wall mounting brackets and monotube structure for incorporation into the signing series.

When including information on detail sheets, use cross-references (a note on the plan sheets indicating where the detail is located).

B. SPECIAL PROVISIONS

WSDOT Plans Preparation Manual Division 6 “Contract Provision” contains information necessary to compile the provisions for a contract bid package. The contents of contract provisions are listed in section 610.01. The designers are only responsible for the amendments and special provisions.

Amendments are revisions to the WSDOT Standard Specifications that are distributed between printings. See section 620 of the Plans Preparation Manual. Continuously review them when received, to be aware of any changes and avoid conflict between the amendments, special provisions and plans. Obtain the most current set of amendments from the LAN systems or the WSDOT home page (www.wsdot.wa.gov) under Environmental and Engineering Service Center – Project Development Branch.

The Special Provisions are composed of general special provisions (GSP's) and project specific provisions. The GSP's are standardized provisions that address fairly common construction or material features that are not covered by the Standard Specifications. They are accepted and approved methods and requirements. Only use GSP's as is and if they apply specifically to the project. If any modifications are needed, they are no longer GSP's, but become project specific provisions. See section 630.02 of the Plans Preparation Manual for more detailed information on GSP's and their code numbers. Obtain the most current set of GSP's from the LAN systems or the WSDOT home page (www.wsdot.wa.gov) under Environmental and Engineering Service Center – Project Development Branch. Be sure to check with the region for any region specific GSP's.

Project specific provisions are written by the designer to supplement or revise information in the Standard Specifications or amendments. They are for unique components of work that do not have a standard specification or GSP. See section 630.03 of the Plans Preparation Manual. Using provisions from a previous project is acceptable, but tailor the information to meet the specific requirements of the current project. Do not duplicate any of the information in the Standard Specifications or amendments. The Standard Specifications and GSP's cover most signing construction and materials encountered, therefore project specific provisions are usually not needed. Whenever possible, use standard materials and construction requirements, as these will almost always cost less than special items.

Take care in writing the Special Provisions since they have precedence over the Plans. Only use Special Provisions for information that can not be easily placed on the plans, otherwise include the information in the details or plan sheets. Avoid repeating information in the Special Provisions that is in the plans to eliminate possible conflicts.

Provide a run-list to the project office, indicating the code numbers for the desired amendments and GSP's, and file names for project specific specification. The project office will compile the special provisions based on the run-list and any electronic files for project specific provisions. See Section 610.01 of the Plans Preparation Manual.

C. COST ESTIMATE

An Engineer Estimates for construction is needed in order to obligate fund for the construction of the project and for evaluating contractor's bids. See Division 8 "Contract Estimate" of the WSDOT Plans Preparation Manual.

Per sections 8-21.4 and 8-21.5 of the Standard Specifications, the contract bid item "Permanent Signing" is a lump sum. The lump sum is to include the sum of the individual sign installations, relocations and removals, including all labor and materials necessary to perform the work. Sign bridge structures, cantilever sign structures, bridge mounted sign brackets, and sign coverings are estimated and paid for separately. Those lump sum costs shall include all labor, materials, and equipment required to furnish and install each sign item.

All bid items are broken down by project groups and appear in the Summary of Quantities in the contract plans. The project office provides the group breakout for the project. Even though the contract plans will show L.S. (Lump Sum) for each group, not a price, the estimate is still divided by group for use by the department. Separate the work into the appropriate groups prior to compiling the lump sum estimate.

In the engineer's estimate, identify the cost associated with each sign location. If modifications are required during construction, this will help the construction office determine if an adjustment to the lump sum price is required based on the original costs for each sign location.

Verify the prices of materials to ensure the accuracy of the estimate. Prices may vary based on geographic location. Once the estimate has been completed, round the totals to the nearest \$1000 for each lump sum item.

The estimate for the entire project will be entered into the Estimate Bid Analysis System (EBASE). See section 830 of the Plans Preparation Manual.

Cost estimate sheets used by Northwest Region are located in Appendix D of this manual.

D. REVIEW PROCESS

The permanent signing PS&E is usually prepared in the Northwest Region Traffic Office (except for consultant designed plans or WSDOT designed plans where the Northwest Region Traffic Office has agreed to another WSDOT office completing the plans). The completed signing package is then included by the project design office within the contract documents. Regardless of who prepares the signing PS&E, it must be reviewed. Attach a Signing PS&E Checklist with the completed sheets for PS&E review.

The items on the checklist shall be marked off as they are preformed. Obtain this checklist while gather information for project. Signing PS&E is reviewed by the Northwest Region Traffic Office to verify that all signing standards and policies are adhered to and ensure that the sign placements and strategies are consistent with similar locations within the Region. Also review the plans for conflicts between sign installations and other project features.

In addition, the Olympia Service Center (OSC) Traffic Office may review signing PS&E that includes new or reconfigured interchange guide signs. Guide sign design and installation must be consistent statewide in order to meet driver expectations. The OSC Traffic Office will ensure statewide compliance with the MUTCD requirements and the WSDOT policies. They also review new procedures or installations being proposed for a project for future use or statewide implications.

Contact the Northwest Region Traffic Office for any review schedules or requirements for consultant prepared signing PS&E.

E. GLOSSARY

Basemap – A set of plans that contains all existing features and objects in the project area.

Clearzone – Total roadside border area, starting at the edge of the traveled way, available for use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. Refer to Design Clear Zone and Safety Features of this manual.

Conspicuity – The ability to stand out and attract the attention of a driver.

Delamination – The deterioration of the sign adhesive and ultimate separation of the substrate and sheeting material.

Drilled – The act of putting holes into wood posts to allow the posts to breakaway when struck.

Drop Lane – A traveled lane that leaves the mainline. These typically occur at exits, where a lane is an exit only lane. The “drop lane” leaves the mainline, and the mainline continues with one less lane beyond the exit.

Engineering Judgment – To make an educated decision based on engineering knowledge and experience, followed with a logical explanation.

Errant – A vehicle that diverges from the defined path of the roadway. To be in error.

Legibility - The ability to read. For signs, this is based on letter size and legend spacing.

Notch – A V-shape cut in a surface, such as a wood post.

Standards - An established set of specific guidelines from which an element is designed to ensure similar characteristics and consistency.

Static – Unchanging, not moving over a period of time.

Substrate – The rigid material of a sign which lays under and supports the sign sheeting.

Symbols – An image or shape representing an idea or direction.

Traveled lane – The portion of a roadway (lane) used by vehicles to move from one point to another.

Uniformity – Consistency between like objects or situation

F. BIBLIOGRAPHY

- Bridge Design Manual, M23-50. Washington Department of Transportation,
Program Development Division, Bridge and Structures, 1993. Section 8.2.2.
- Construction Manual, M41-01. Olympia: Washington State Department of
Transportation, Construction Office, 1996.
- Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators
Adjacent to Freeways. Washington DC.: American Association of State Highway
and Transportation Officials, 1993._
- HOV Design Guide for the Northwest Region. Seattle: Washington State Department
of Transportation, Transportation Office, 1998
- Manual on Uniform Traffic Control Devices (MUTCD). US Department of
Transportation, Federal Highway Administration, 1988 Edition.
- Revised Code of Washington (RCW). Olympia: Washington State Legislature.
- Standard Specification for Road, Bridge, and Municipal Construction. Washington State
Department of transportation and American Public Works Association. 1998.
Section 8-21 and 9.28.
- Washington Administrative Code (WAC). Olympia: Washington State.
- Washington State Modifications to the MUTCD. Washington State Department of
Transportation, Transportation Office.
- WSDOT Design Manual, M22-0. Washington State Department of Transportation,
Environmental and Engineering Service Center Design Office. Section 820.
- WSDOT Maintenance Accountability Process. Washington State Department of
Transportation, FOSSC Maintenance Office, January 1998.
- WSDOT Plans Preparation Manual, M22-31. Washington State Department of

Transportation. Engineering Publications, Transportation Office. Section 460.
WSDOT Sign Fabrication Manual, M55-05. Washington State Department of
Transportation, Environmental and Engineering Service Center Design Office.
WSDOT Standard Plans, M21-01. Washington State Department of Transportation and
American Public Works Association, Engineering Publications Transportation
Office. Series G.
WSDOT Traffic Manual, M51-02. Washington State Department of Transportation,
Operations and Maintenance Office. Chapter

Appendix A – Signing Checklist

Signing Project Checklist

Project Overview

- ❑ Review scope/objective of project *(Chapter II)*
- ❑ Determine design level – Design Manual, Section 325 *(Chapter II)*
- ❑ Obtain basemaps showing existing features *(Chapter VI Section A)*

Visit Site

- ❑ Get familiar with area *(Chapter III Section A)*
- ❑ Note physical restriction or any special features *(Chapter III Section B & C)*
- ❑ Inventory existing signs *(Chapter III Section D)*

Preliminary Sign Layout

- ❑ Determine type of plans - strip map vs. full basemap *(Chapter VII Section A)*
- ❑ Layout guide signs - including legend *(Chapter IV Sections A & F)*
 - ❑ Maintain continuity *(Chapter IV Section C)*
 - ❑ Consider adjacent projects *(Chapter IV Section D)*
- ❑ Decide which guide signs will be ground mounted or overhead *(Chapter IV Section F and Chapter VI Section D)*
- ❑ Consider having preliminary guide sign plan reviewed *(Chapter IV Section F)*
- ❑ Layout regulatory and warning signs *(Chapter IV Sections A & F)*
- ❑ Consider any special or temporary signing *(Chapter IV Sections B & E)*
- ❑ Determine which existing signs to reuse, relocate, etc. *(Chapter IV Section G)*

PS&E

- ❑ Identify sign installations, removals, and relocates on plans *(Chapter VII Section A)*
- ❑ Assign sign numbers for installations, removals, relocates *(Chapter VII Section A)*
- ❑ Begin sign specification sheets and details *(Chapter VII Section A)*
- ❑ Design signs *(Chapter V)*
 - ❑ Layout legend *(Chapter V Section A & B)*
 - ❑ Size legend *(Chapter V Section B)*
 - ❑ Determine letter height or overall sign size *(Chapter V Section B)*
 - ❑ Calculate sign size *(Chapter V Section B)*
- ❑ Incorporate sign details into plans *(Chapter V & Chapter VII Section A)*
- ❑ Choose reflective sheeting type *(Chapter V Section C)*
- ❑ Obtain cross-sections from Project Office for sign structures *(Chapter VI Section D)*
- ❑ Determine sign placement - lateral and longitudinal *(Chapter VI Section A)*
- ❑ Calculate post/support type, number, size, and length *(Chapter VI Sections B, C & D)*
- ❑ Determine number of sign lights for overhead signs *(Chapter VI Section D)*
- ❑ Finalize specification, plan, and detail sheets *(Chapter VII Section A)*
- ❑ Have set of plans reviewed, peer review before PS&E turn-in *(Chapter VII)*
 - ❑ PS&E's submitted to the Northwest Region Traffic Office *(Chapter VII Section D)*
 - ❑ Northwest Region Traffic Design Quality Control Procedure *(Chapter VII Section D)*
- ❑ Prepare special provisions *(Chapter VII Section B)*
- ❑ Prepare cost estimate *(Chapter VII Section C)*

Signing PS&E checklist below needs to be completed by the sign designer.

SIGNING PS&E CHECKLIST

Designer _____ SR _____ Milepost limits _____ L# _____

ProjectName _____

PE Office _____

/ContactPerson _____

COMMITMENT DATES:

60% Peer Review _____ by _____ QAQC Review _____ by _____

AD Date _____ 100% _____ % _____ % _____

____ 1. Sign inventory reviewed & approved for completeness. (To be done within ONE WEEK of receipt).

____ 2. Base map & sign inventory checked for accuracy in regards to sign locations. Spot check at info at the beginning, middle & end of project. (To be done within TWO WEEKS of receipt).

Items 3 – 8 **are to be done immediately prior to or within two weeks** of starting work on PS&E:

____ 3. Email sent to Central Operations (Mario Mathisen), General Operations (Dave Deede), Signal Operations (King Co. - Don Sims; Snohomish Co. – Dongho Chang; Mt. Baker – Mike Swires.), Special Projects (Darrel Whyte), and Traffic Safety Magnagement (Nafisa Peshtaz), asking if they have any projects, issues or concerns within the projects milepost limits.

____ 4. TRACTS checked for any commitments / issues within milepost limits (or just outside project limits).

____ Include all found commitments in project or document reason for not doing so.

____ If issues found within a reasonable distance outside project limits contact Design Office to find out if they can be included. Document findings and put in file.

____ 5. HAL/HAC/PAL book checked.

6. Electrical/ITS Design checklist:

____ a. Contact Signal Designer, if applicable, to determine signing needed on mast arms.

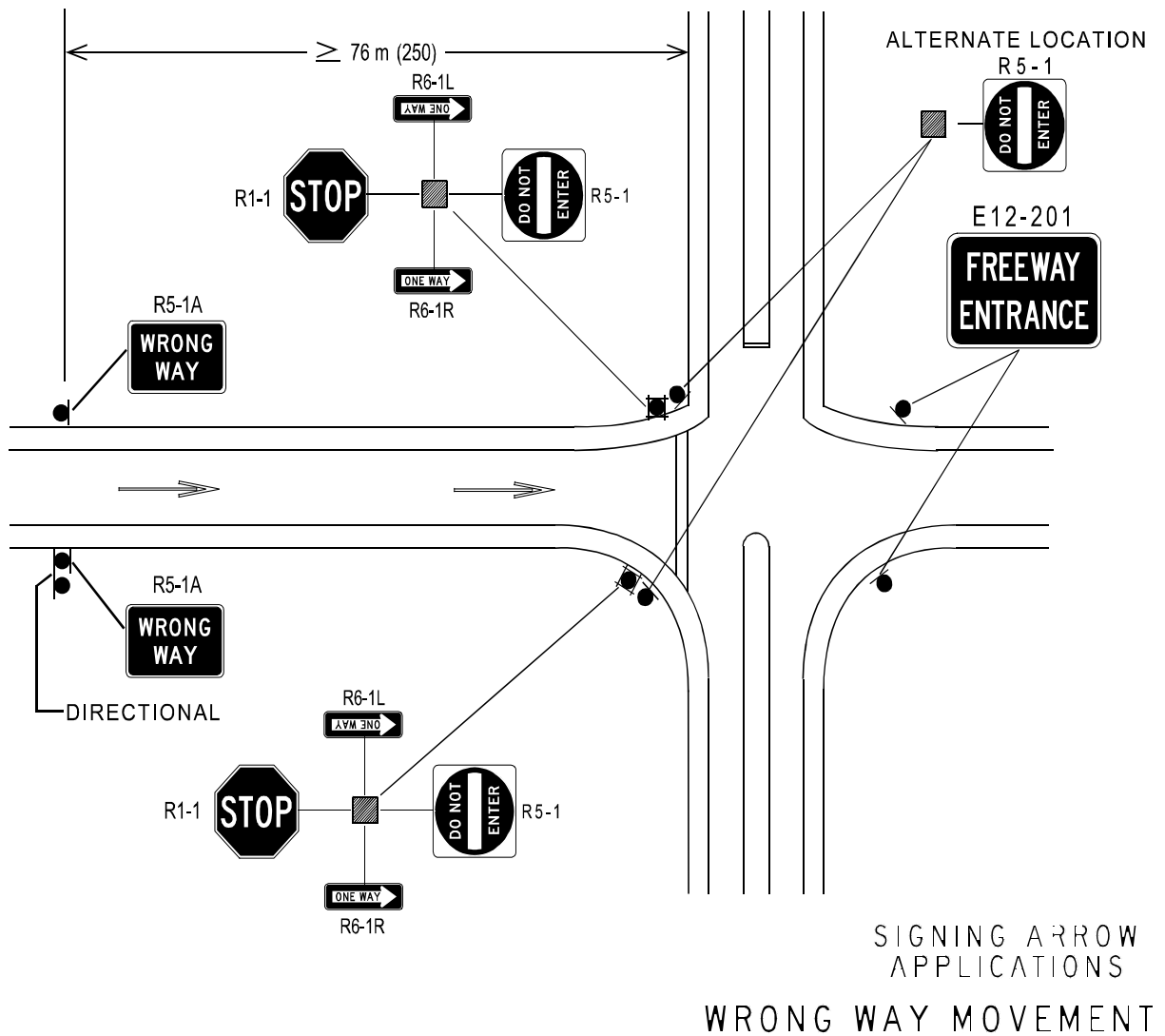
____ Also provide designer with sizes of street name signs for wind loading purposes.

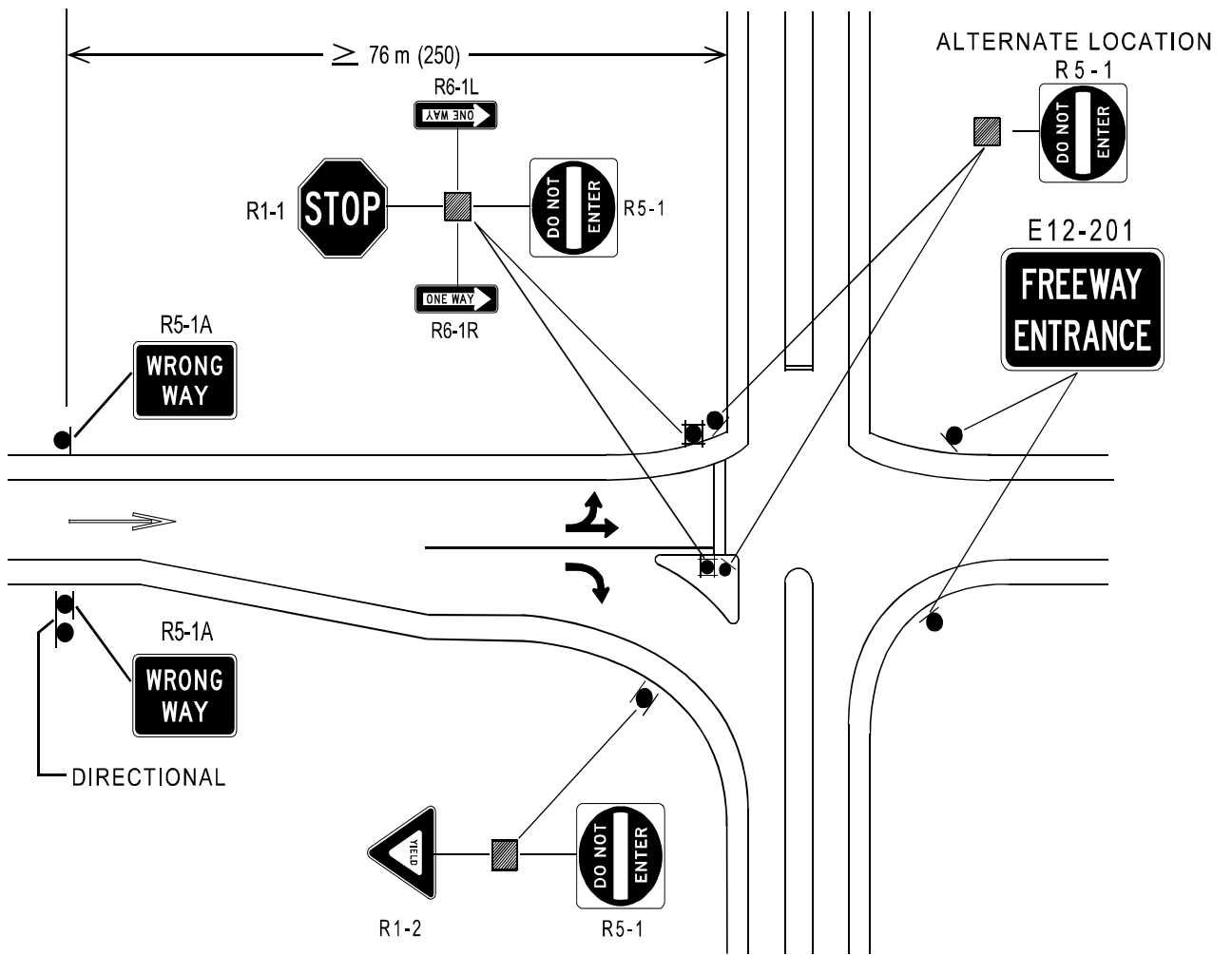
____ b. Contact Illumination Designer, if applicable, to determine if there are any conflicts or if their hardware can be used to mount any of our smaller signs (up to 20 sq. ft.)

____ c. Contact ITS Designer, if applicable, (see above)

- ____ 7. If any Adopt A Highway signs in project, contact appropriate group.
- ____ 8. Contact Sign Tech (and/or maintenance) to discuss any known problems or issues there may be in the area.
- ____ 9. Overhead sign needs checklist:
- A. Will more overhead signs be needed? Yes/No (circle answer)
- If yes, will Design Office approve them? Yes/No (circle answer) Document in writing & put in file.
- B. Are the existing overhead sign structures in good condition?
- Yes/No/Maybe (circle answer) Document in writing & put in file.
- (Check online sign bridge inventory AND contact Jim Wege @ OSC Bridge Preservation Office)
- C. If structures are needed:
- ____ 1. Send a soils request to NWR Materials Lab (Chris Johnson) – MS NB82-29.
- ____ 2. Send a structure(s) request to OSC Bridge (Rich Zeldenrust) – MS 47340.
- ____ 3. Contact OSC Bridge for estimate for all structures.
- ____ 10. Project site visited. This should be done after you have started working on the project and have made sure all signs in the inventory are shown on the base map. *If any subsequent field trips are necessary please document reason for trip and put in file.*
- ____ 11. Contact Design Office to determine if there will be any conflicts between permanent signing and construction
- phasing signing.
- ____ 12. Prepare lump sum construction estimate.

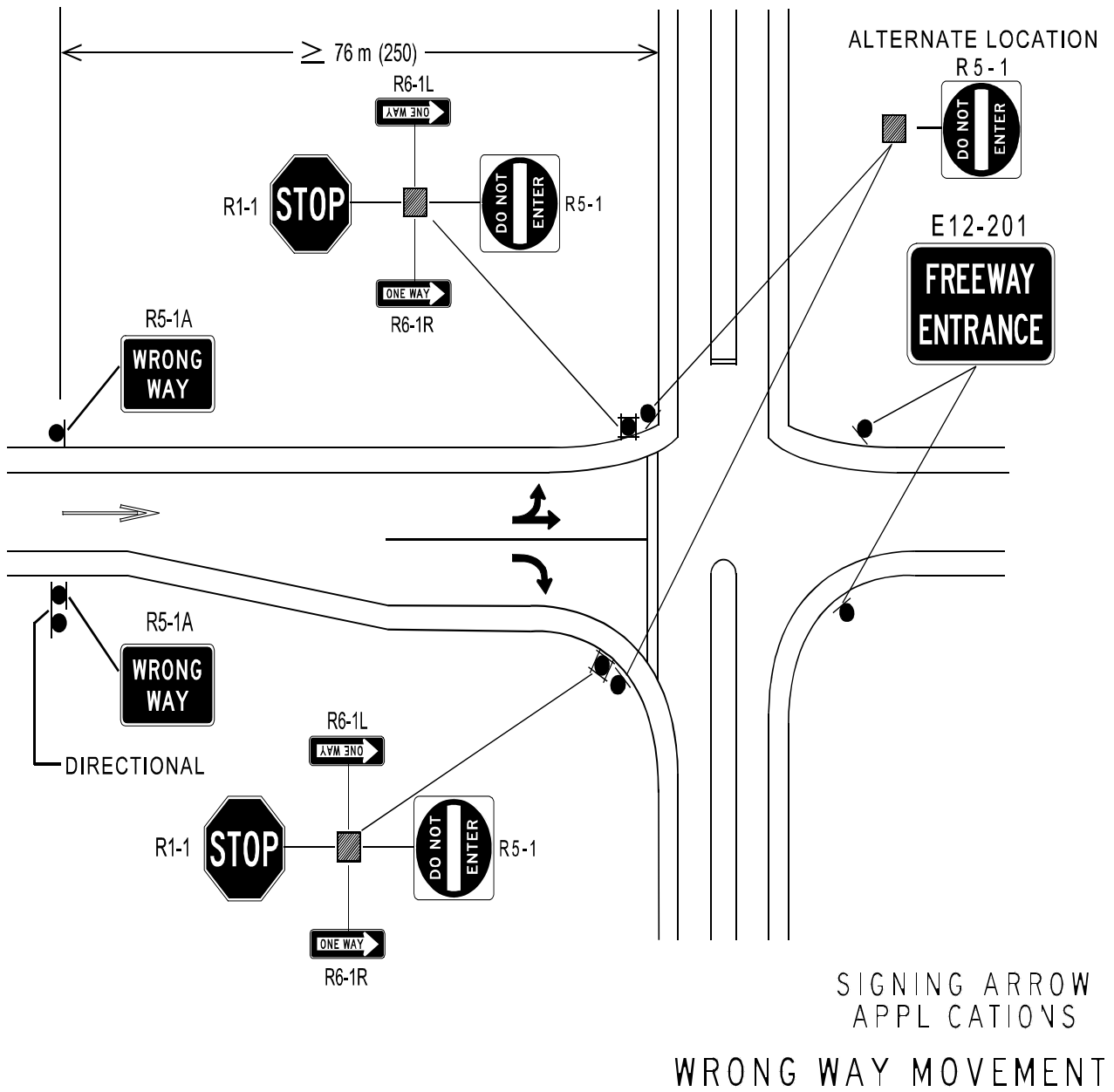
Appendix B – Wrong Way/One Way Signing

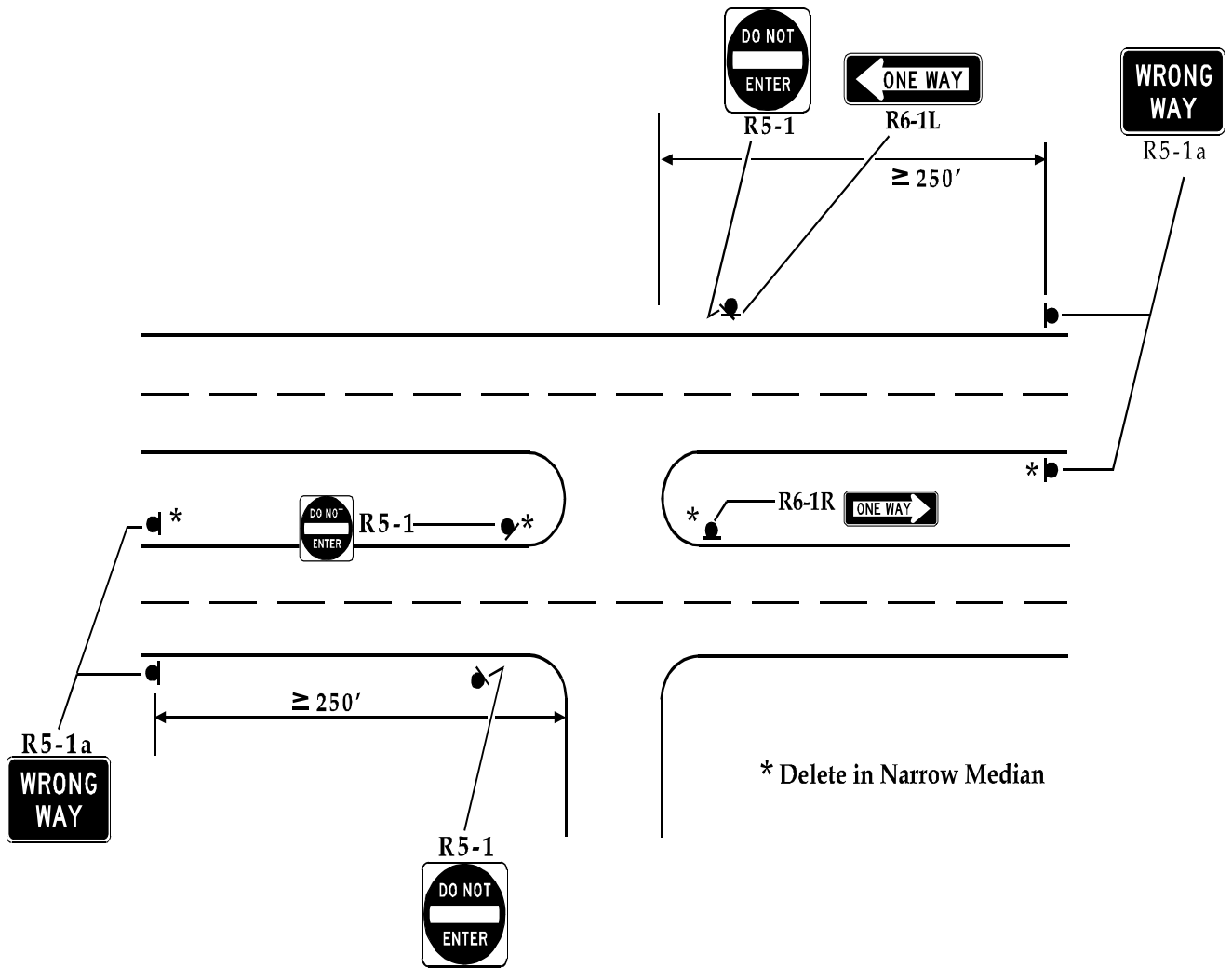




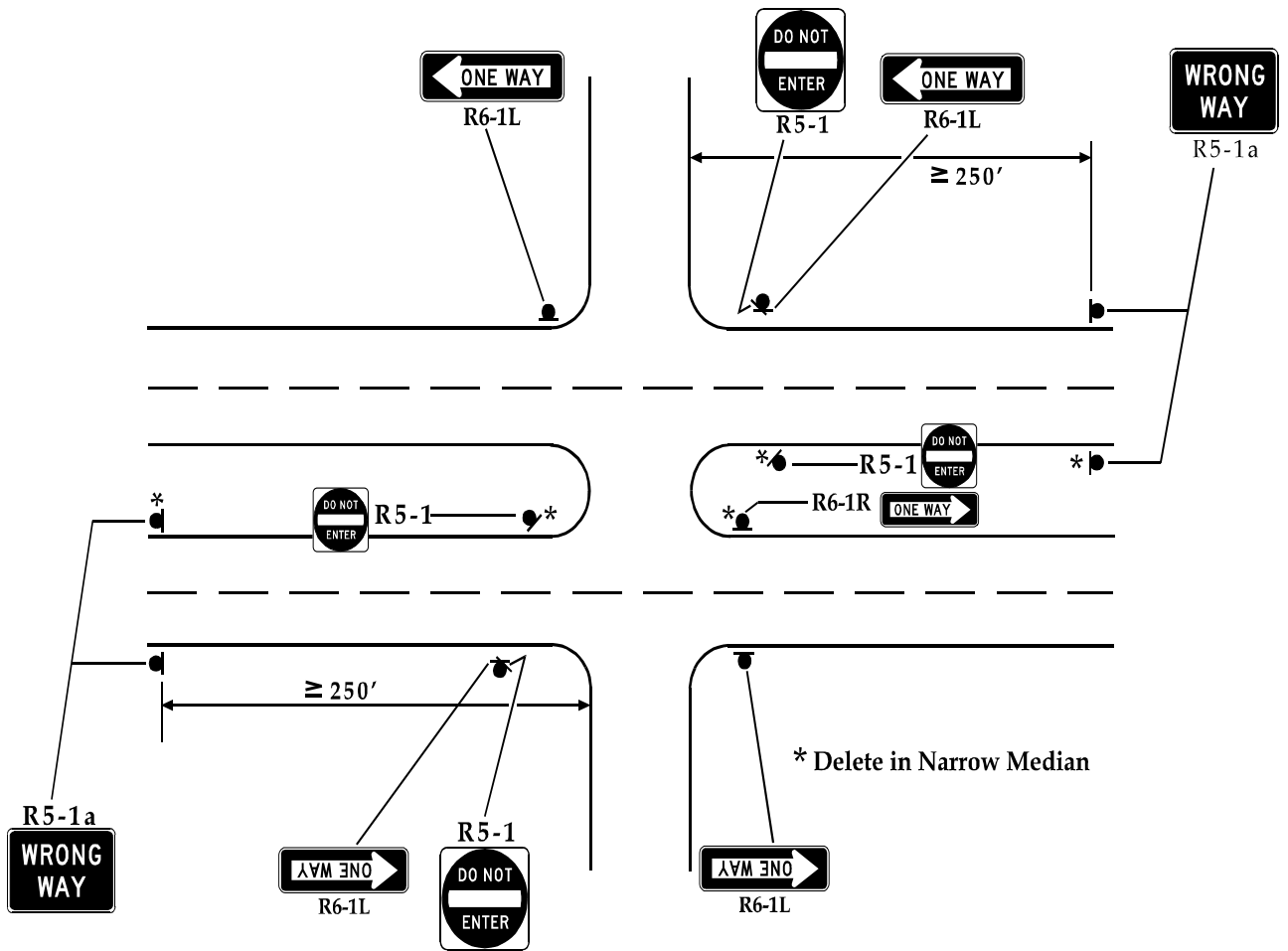
SIGNING ARROW
APPL CATIONS

WRONG WAY MOVEMENT





WRONG WAY SIGNING- AT GRADE TEE INTERSECTIONS



WRONG WAY SIGNING- AT GRADE INTERSECTIONS

Appendix C- Letters and Memos



Date: August 5, 1996

From: Fred Sommer/Rick Mowlds

Phone: 705-7296/705-7988

Subject: Steel Sign Posts

To: Les Jacobson
Jennene Ring
Toby Rickman
Ted Paselk
George Hilsinger
Bob Earnest
Lorena Eng
Dan Sarles
Gary Richardson
Al McDonald
Guy Couture
Gary Janousek

It has been brought to our attention about some confusion regarding Steel Sign Posts used on contracts. Specifically, there is a duplicate post size of W6x12 for AASHTO M 183 and AASHTO M 222 or M 223, and the M 222 or M 223 W6x12 post can handle a larger sign than compared with the M 183 W6x12 post.

The Department primarily uses AASHTO M 183 steel sign posts. To eliminate this confusion, we request the AASHTO M 183 steel post to be shown on all Sign Specification Sheets when Steel Posts are used. Please add a note to the Sign Specification Sheets to say "Steel Sign Posts are AASHTO M 183."

Please ensure this information is forwarded to your Sign Designers. If you have any questions, please contact Rick Mowlds at (360) 705-7988.

FS/RM

cc: Dave McCormick

STEELSP



Memorandum

Date: January 6, 1999

From: Jim Shanafelt
Phone: 705-7282

Subject: Steel Sign Post Bases

To: Les Jacobson, NB82-120 Lorena Eng, NB82-110
Jennene Ring, North Central Region Dan Sarles, North Central Region
Toby Rickman, 47440 Gary Richardson, 47440
Les Rubstello, S-15 Bart Gernhart, S-15
Rick Gifford, South Central Region George Hilsinger, South Central Region
Ted Trepanier, Eastern Region Keith Metcalf, Eastern Region

It has been brought to our attention that there is confusion regarding Steel Sign Posts specified in contracts. Specifically, when multiple steel sign posts are being specified for a given sign location, the correct base type for the steel posts has been omitted. This omission has caused problems for contractors and their suppliers both in bidding and supplying the correct base type.

The base serves as the breakaway feature for each steel sign post. There are three different base types to choose from, see Standard Plan G-8a, "Roadside Sign Structures for Multiple Steel Post Signs", they are as follows:

- Type 1 base design is used at locations adjacent to a roadway where the sign post could be struck from only one direction (frontal).
- Type 2A and 2B base design is used at intersections and other locations where the sign post could be struck from any of several different directions (multi-directional).

Please specify the correct base type on the Sign Specification Sheets under Remarks, for each sign location with multiple steel posts. See attached Sign Specification Sheet for an example.

Please ensure this information is forwarded to your Sign Designers. If you have any questions, please contact Rick Mowlds at (360) 705-7988.

Attach.

JRS/RM
cc: Dave McCormick, NB82-120



Memorandum

Date: December 12, 2003

From: David K. Peach

Phone: 360-705-7280

Subject: Turn/Curve Signs and Advisory Speed
Plaques - New Placement Guidelines

To: Bob Earnest, Eastern Region Jennene Ring, North Central Region
Les Jacobson, Northwest Region Toby Rickman, Olympic Region
Bob Baker, South Central Region Ted Paselk, Southwest Region

Per the discussion last week at the Regional Traffic Engineer's meeting, Chapter 2 of the Traffic Manual, Section 2.4 P. "Turn and Curve Signs and Advisory Speed Plaques" is deleted, and replaced with the following:

The MUTCD provides that the TURN (W1-1) sign is intended for use where engineering investigations of roadway, geometric, and operating conditions show the advisory speed of horizontal curvature to be 30 mph or less and that the CURVE (W1-2) sign is to be used when the advisory speed is between 35 mph and 65 mph, and the advisory speeds are equal to or less than the legal speed limit.

Advisory speed plaques are intended for use when engineering investigations of roadway, geometric, or operating conditions indicate the need to advise drivers of a recommended speed. The advisory speed plaque is used only to supplement other warning signs.

For turns and curves the recommended advisory speed should be determined by means of a Ball Bank Indicator evaluation in accordance with the following:

Advisory Speed (MPH)	Maximum Ball Bank Reading
20 or less	14
25 and 30	12
35 and greater	10

Use the warning signs where the recommended speed is 5 mph or more below the legal speed limit, and add advisory speed plaques where the recommended speed is 10 mph or more below the legal speed limit.

My office will evaluate the NCHRP "Speed Advisory Study" and provide information regarding the results of this study. If you have any questions, please contact Rick Mowlds at (360) 705-7988.

DKP/RM

cc:

Jim Shanafelt

Dave McCormick, NB-82/120

From: Harris, Rob (NWCAE)

Posted At: Thursday, October 14, 1999 10:05 AM

Conversation: Signing Design -Microstation Procedures Posted To: NW CAE Notices

Subject: MS: Signing Design -Microstation Procedures

The attached procedure was worked between representatives of design offices, Signing and CAE Support to address complaints from Signing and design offices in regards to the creation of signing plans for inclusion in a PS&E.

Following the procedure when transferring MicroStation data between design offices and Signing Design will address the problems encountered by all parties -Signing will get the data they need to easily do their design, and the design office will receive files from signing in the format they desire.

Please use the procedures outlined in the attached document on all future signing jobs. Address any comments on the procedure to CAE Support.

Signing Agreement doc

Malloy, Bill

From: Day, Russell

Sent: Wednesday, February 20, 2002 12:02 PM

To: Trotter, Chris; Do, Duke; Deede, Dave

Cc: Allen, Archie; Dinges, David; Nilsen, Steve; Schafi, Ahmad; Anglin, Laurinda; Pham, Khoi; McCall, Scott; Portello, Doug A.; Chang, Dongho; Swires, Mike; Bandy, Mark; Sims, Don

Subject: Identifying removed sign bridges, cantilevers and bridge mounted brackets

Steve Nilsen from Bridge Maintenance has requested, on any contracts where we are removing an existing sign bridge, cantilever or bridge mounted bracket that we include the SID number for that sign structure on our plan sheets. This SID number is the number that has been assigned to that structure in the SIGN BRIDGE REPAIR LIST and starts with SB????? In most cases there is a tag on the sign structure in the field with the SID number on it.

Please add this SID number to any PS&E's that you are currently working on with sign structures that are being removed. Also make sure the consultants and design offices are including this SID number in their contracts that we review.

THANK YOU

Russell Day

NW Region Sign Design

E- Mail:dayr@wsdot.wa.gov Phone: (206)440-5033 Fax:(206)440-4804

SIGN REPLACEMENT CRITERIA

To insure adequate and consistent replacement of signs on projects, please use the "formula" shown below (which will change as opinions, materials, and methods change).

For ground mount and unlit overhead signs, retro-reflectivity is the controlling factor. For illuminated overhead signs, structural integrity controls.

NW Region has had several overhead sign panels fall. Of the ones I am aware of, all fell when the rivets failed and all were over 15 years old. As WSDOT has no guidelines on rivet longevity, 10 years was selected as our value (for replacing overhead illuminated signs). This may change if factual information is discovered on this subject.

Criteria Formula:

Replace all ground mount signs over 7* years old.
Replace all unlit overhead signs over 7* years old.
Replace all illuminated overhead signs over 10* years old.

* To determine the age of the sign, use the date stamp on the back, or if none, assume the sign was made prior to 1985. Further, if the present age of the sign is less than 7 years it may still need replaced. The real question is, what will the age and condition of the sign be at the time the project is doing permanent signing work?

For example, on large projects 2 or 3 years may elapse from the AD date to when the permanent signing is actually (typically) done. Smaller projects only take a year or so. If you use a formula of "1 year of construction for each \$10-\$15 million in total project costs" you will be in the ball park.

There will, of course be exceptions. And they may be either replacing sooner or later than the figures given.

Some reasons for replacing sooner:

- 1) Sign no longer proper for location (channelization etc).
- 2) Sign inventory reveals sign in poor condition (premature aging, got hit, vandalism, etc.)
- 3) Change in sign use policy, etc.
- 4) Commitment made to public, city, etc (change message, etc).

Reasons for replacing later:

- 1) A second project scheduled for the same MP which may change messages, channelization, etc. (and the sign is in good condition)
- 2) Signs in extra-ordinary good condition (must be documented with night review or retro-reflectometer)
- 3) Signs made with 3-M High Intensity sheeting (effective life ~ expectancy is 10 years).

Signing Design With Microstation.

In the past there have been problems with the process creating and transferring signing plans in MicroStation.

Signing's major complaints on the process were:

- *No control over existing signs.* In the course of their design, signing would often have more accurate information on existing sign locations, yet could not adjust the symbols in the basemap because existing signs are on level 23 and are part of the project basemap.
- *Inconsistent starting material provided by the design offices.* As starting data, signing needs a sheet file with baseplans (both signing and project baseplan) already referenced and a basemap with the sheet locations clearly marked.
- *Problems with non-standard/non-documented levels in the project basemap.* signing needs to reference certain levels of the project basemap to the signing sheets. If the items they need to reference are not on the correct level and there is no documentation on what level the information is on, much time is spent tracking the level scheme down.

The design offices' major complaints were:

- *Coordinate based information drawn on sheets.* Signing often drafted their designs directly on the sheet rather than including that information in a real coordinate basemap that could be ultimately merged in with the project basemap.
- *Inability to view signs without the notes.* Proposed sign locations could not be viewed without the notes showing up -all signing information was on level 54.

So to address these complaints, I propose the following procedure.

What the Design Office Will Supply to Signing:

Since the project office is responsible for deciding sheet locations and marking their locations in the baseplan(s), they prepare the signing basemap and sheet file.

Signing basemap. This file should be blank except for a copy of Level 23 from the project basemap, and a saved view for each plan sheet in the project. This signing basemap should be referenced coincidentally with the project basemap so that changes by the design office are visible to the signing group and also so that the elements marking the sheet limits and match lines in the project basemap are visible to signing.

A copy of level 23 is needed for two reasons. First, because the existing signs are on level 23 and Signing needs to be able to adjust their locations if necessary. Once all adjustments have been made to existing

sign locations, the design office will be notified and can delete the existing signs in the project basemap and copy the adjusted sign locations from the Signing basemap into the project basemap. The second reason for a copy of level 23 is because Signing uses some of the other features on this level and not others in their plans. This means they will need to delete unneeded elements from their copy of level 23 and reference the partial level to their sheets.

The easiest way to create the signing basemap is to copy the project basemap and delete all but level 23. Then reference the project basemap. This creates a signing basemap that has all necessary saved views (they may need to be renamed), the copy of level 23, and visible limits/matchlines (from the project basemap) for all the sheets marked.

Signing sheet file. This file contains sheet borders for the signing plans with both the project and signing basemaps referenced. Copying a sheet file already set up in the project can easily create this file. The reference file attachments in the copy can then be copied and edited to point at the signing basemap. The project basemap attachments should be pointing to the master version of the project basemap that resides on the S: drive with the full path saved.

Documentation on levels used. Ideally all items in the project basemap should be on the standard levels. However, if exceptions to the standard scheme are needed in the project office, these level scheme additions/changes need to be made known to signing. They should be documented in the comments portion of the documentation sheets.

Providing the information above will facilitate Signing in doing their portion of the design and make it much easier for them to provide the work in the format the design office would like. From working with the information design provides,

Additional level for signing to use. The design office should not use Level 59. In order to provide the capability to view proposed sign locations without the notes, Signing needs to put the sign symbols and the notes on different levels. So the project office needs to provide an additional reserved level and not place any of their information there. The standards specify that Level 59 is and will fill the need for a second signing level.

Signing will provide:

Existing sign locations. Sign will provide a checked and correct set of existing sign locations for inclusion in the project basemap. This would probably take the form of a file containing only the signs that would be sent to the design office. Upon receipt of this file, the design office can delete all the existing sign cells from the project basemap (use Edit=>Select by Attributes) and merge in the adjusted cells provided by Signing.

Completed Signing basemap. This file will contain all coordinate based sign locations and their associated text. The sign symbols will be on Level 54 and the text will be on Level 59. Non-coordinate based signing information such as details and schedules may be drawn in the sheet files.

Signing sheet file. This file will have displayed levels adjusted properly for the signing plans and completed documentation sheets.

Appendix D – Forms and Examples

WSDOT NW REGION COST ESTIMATE SHEETS

- *Standard* -

SIGNING ESTIMATE WORK SHEET

PROJECT NAME:

NEW PERMANENT SIGNS

	Quantity	Unit	Unit Price	TOTAL
Single post signs		FT^2 X	\$16.00 =	\$0.00
Multi-post signs		FT^2 X	\$20.00 =	\$0.00
Overhead Signs		FT^2 X	\$30.00 =	\$0.00
Wood Posts				
I 4 by 4 or 6		EACH X	\$60.00 =	\$0.00
III 6 by 6		EACH X	\$70.00 =	\$0.00
IV 6 by 8		EACH X	\$115.00 =	\$0.00
V 6 by 10		EACH X	\$160.00 =	\$0.00
VI 8 by 10		EACH X	\$210.00 =	\$0.00
VII 8 by 12		EACH X	\$250.00 =	\$0.00
Steel Posts (4")		EACH X	\$1,500.00 =	\$0.00
Saddle Barrier Mounts (signs up to 20 sq ft)		EACH X	\$500.00 =	\$0.00
Sign Lights		EACH X	\$2,200.00 =	\$0.00
Amber Flashing Lights		EACH X	\$800.00 =	\$0.00
Band-it (light standard & mast arm type mount)		EACH X	\$50.00 =	\$0.00
Steel Sleeve (wood posts installed in asphalt/concrete)		EACH X	\$350.00 =	\$0.00

REMOVALS

Single post sign	EACH X	\$30.00 =	\$0.00
Multi post sign	EACH X	\$150.00 =	\$0.00
Overhead sign	EACH X	\$300.00 =	\$0.00
Wood post	EACH X	\$25.00 =	\$0.00
Steel post	EACH X	\$300.00 =	\$0.00
Concrete Base (G-8)	EACH X	\$270.00 =	\$0.00
Concrete Base (G-2b & G-3a)	EACH X	\$860.00 =	\$0.00
Cantilever & Base	EACH X	\$2,000.00 =	\$0.00
Sign Bridge & Base	EACH X	\$4,000.00 =	\$0.00

RELOCATIION

Sign and wood post	EA/PST X	\$60.00 =	\$0.00
Sign and steel post	EA/PST X	\$580.00 =	\$0.00
Sign to new wood post	EA/PST X	\$40.00 =	\$0.00
Sign to new steel post	EA/PST X	=	\$0.00
Cantilever *	EACH X	\$6,500.00 =	\$0.00
Sign Bridge	FT X	\$165.00 =	\$0.00
Sign to Exist. Structure **	EACH X	\$40.00 =	\$0.00

SIGN REVISIONS

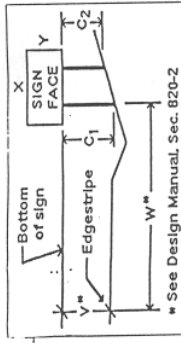
Messages	LTR X	\$50.00 =	\$0.00
Overlay	FT2 X	5.00 =	\$0.00
Sign Lights	EACH X	\$2,200.00 =	\$0.00

- also include cost for removal and reinstallation of sign(s) & electrical
- ** to be discussed with supervisor/group

If inquired item not listed contact Sign Design, Bridge, Electrical, ITS.

WSDOT NW REGION
SIGN INVENTORY FORM

WSDOT NW Region
Sign Inventory Sheet

[illegible]

WSDOT NW REGION

SIGNING PS&E EXAMPLE

Sign Specifications

[illegible]

NOTES: ■ POST LENGTHS SHOWN ARE APPROXIMATE. FINAL VALUES SHALL BE DETERMINED IN THE FIELD BY THE CONTRACTOR PRIOR TO FABRICATION. FOR STRUCTURE AND MOUNTING DETAILS SEE STANDARD PLAN SHEET SERIES "G". FOR CODE REFERENCES AND STANDARD DETAILS SEE WASHINGTON STATE SIGN FABRICATION MANUAL.

CONSTRUCTION NOTES:

1. INSTALL SIGN AS STAKED BY ENGINEER.

[illegible]

Appendix E – Sign Design Team Contacts

WSDOT NORTHWEST REGION SIGN DESIGN TEAM*

SUPERVISOR

SCOTT MCCALL

5032

DESIGNERS

King County.....Laurinda Anglin 4923

Mt Baker.....Khoi Pam 5034

Snohomish.....Doug Portello 4429

***All telephone numbers have area code 206 and prefix 440.**

Appendix F – Consultant Information

CONSULTANT INFORMATION

General

**Consultant Designers should first read the Introductory section of this manual before proceeding
(See Pages 1 and 2 of this manual).**

Each WSDOT project assigned to a consultant for Signing PSE preparation shall also have a WSDOT Sign Designer assigned to it. The WSDOT Designer will be a member of the Northwest Region Traffic Sign Design Team (See Appendix "E").

The main roles of the WSDOT Sign Designer are - 1) to serve as a contact point for questions that may arise during preparation of the Signing PSE, and 2) To periodically review and comment on the Signing PSE package as it is developed by the Consultant Designer. These periodic reviews will normally coincide with the benchmark reviews conducted by the WSDOT Design Office (e.g., 30%, 60%, 90% completion levels -or other as outlined in the established agreement between WSDOT and the Consultant Office).

Contact Northwest Region Traffic

As indicated in the Introductory section of this manual, it is recommended that Consultant Designers establish contact with the Northwest Region Traffic Sign Design Team early in the design development process (preferably in the form of a meeting). This process is encouraged to allow preliminary assessment of project signing needs, to clarify task assignments for the design file and the Signing PSE, and to ensure an effective coordination schedule between WSDOT and the Consultant Designer in regard to the development of the Signing PSE.

Research Tasks

On many projects there is a need to research WSDOT files for information that may affect the design of signs on the project. This may involve such things as previous commitments that may have been made by WSDOT for certain locations, Traffic Analysis or Traffic Operations information, the relationship of the current project with other ultimate plans for development, or other items.

This type of research will normally be conducted by the WSDOT Sign Designer assigned to oversee the Consultant's Signing PSE development. It is important, however, for the consultant to receive any such information that is discovered (this is one point to be discussed at the contact meeting mentioned above).

Preliminary Signing Plan

The need for and method of development for a preliminary signing plan are outlined in Chapter IV of this manual. This process is particularly important when a project will include a number of guide signs, overhead signs, or a complex signing scheme.

Note that Chapter IV of this manual says to layout guide signs first. This is essential to allow early definition of guide sign messages needed, and appropriate locations for them. Taking the time and effort within this process to also correctly size any new guide signs determined to be needed is important, so that the need for new sign support structures (or possible modification of existing sign support structures) can be determined.

Overhead Sign Structures

After necessary guide sign sizes have been calculated for the project it is necessary to determine which guide signs will need to be placed in overhead positions. Sometimes existing support structures (cantilevers, sign bridges or roadway undercrossings) are already located in the correct locations for the new signing scheme (or appear that they might be relocated to serve the current signing need), and it may be possible to "re-use" them for supporting the new signs. The determination of adequacy for existing sign structure "re-use" is always to be made by the WSDOT Bridge and Structures Office in Olympia.

When new overhead sign support structures are found to be needed the design work for them must be initiated early in order to allow time for preparation of those detailed plans (See Page 89 of this manual for the selection of overhead sign structures within WSDOT Northwest Region). In addition, soils information will have to be gathered for some overhead structures (cantilever structures and sign bridges). Agreement between WSDOT and the Consultant Designer is needed early in the design process as to which party (i.e., WSDOT or the Consultant) will obtain soils information, and which will prepare the detailed sign support structure plans.

When OSC Bridge and Structures Office is requested to design sign support structures for a project they require specific information to be sent to them. Information on the

elements that they require can be obtained from the Northwest Region Traffic Sign Design Team. OSC Bridge and Structures Office normally reviews sign structure plans that have been done by others for WSDOT projects, in order to ensure their adequacy.

Note that the choice of plan scale and the level of development of sign details are directly related to how readable and understandable the signing plans will ultimately be. Based upon past experience, WSDOT Northwest Region has developed its guidelines relating to these issues for specific reasons. Please read carefully the sections within this manual relating to these subjects (and particularly the "NOTES TO DESIGNERS" on Pages 95 and 101.